Calpine Construction Finance Company, L.P.

717 Texas Avenue, Suite 11.051D
Houston, Texas 77002

March 22, 2013

Mr. Roger Johnson
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: **Petition for Modification for Sutter Energy Center (97-AFC-2C)**

Dear Mr. Johnson:

Please find attached a Petition for Modification for the Sutter Energy Center (SEC). This Petition proposes certain modifications to SEC in order to allow the facility to operate and perform more efficiently and effectively. These modifications include: (1) addition of an auxiliary boiler to maintain heat or preheat steam cycle elements for faster plant starts and (2) expansion of the air-cooled condenser for increased efficiency and summer output.[1]

This Petition also proposes a new 230kV underground generation tie-line and substation that would change the project's point of interconnection from the grid operated by the Western Area Power Administration (Western) to the grid managed by the California Independent System Operator (CAISO). By interconnecting to the CAISO-controlled grid, SEC will gain broader access to power markets located throughout California. The proposed tie-line would run from SEC for 1.76 miles south and west to a new substation site located adjacent to the Pacific Gas and Electric (PG&E) Company's Table Mountain-Tesla 500 kV transmission line. Once the new tie-line is in service, SEC will discontinue use of Western's existing 3.9 mile above-ground 230 kV generation tie-line that connects the facility to Western's O'Banion Substation, and SEC will ask Western for permission to remove the existing generator tie line.

We look forward to the Commission's timely review of the Petition for Modification.

Sincerely,

Mitchell D. Weinberg
Director of Strategic Origination & Development
Calpine Corporation

---

[1] In addition to the improvements described in this Petition, SEC will also make certain other technological modifications at SEC that do not require a Petition. These modifications include installation of terminal attemperators to increase startup flexibility by decoupling the bottoming cycle, modifications to the fuel gas heating system to eliminate the need to delay starting up the gas turbines until the fuel gas heats, thereby allowing faster starts, modifications to the gas turbine control system logic and fuel gas systems to allow purges to occur at shut down rather than start up and thereby allowing for a faster start-time in the subsequent start-up, installation of electric heaters on HRSG drums to heat it more quickly to reduce hold times during startup and optimization of outlet temperature correction settings for the gas and steam turbines to improve startup times.

PETITION TO AMEND THE LICENSE FOR THE

SUTTER ENERGY CENTER

Yuba City, California

(97-AFC-02C)

MARCH 2013

SUBMITTED TO THE:
California Energy Commission

PREPARED FOR:
Calpine Construction Finance Company, LP

WITH TECHNICAL ASSISTANCE BY:
CH2MHILL

IS012313174350SAC

Petition to Amend

Amendment No. 6

CEC License for the

Sutter Energy Center

Yuba City, California

(97-AFC-02C)

Submitted to

California Energy Commission

Submitted by

Calpine Construction Finance Company, L.P.

With Technical Assistance by

CH2MHILL

March 2013

Contents

Appendixes

Tables

Tables, cont.

Figures

Figures, cont.

Acronyms and Abbreviations

°F	degree(s) Fahrenheit
AAQS	Ambient Air Quality Standards
ACC	air-cooled condenser
acfm	actual cubic feet per minute
ADT	average daily trip
AFC	Application for Certification
ANSI/ASME	American National Standards Institute/American Society for Mechanical Engineers
ARB	California Air Resources Board
ARM	ambient ratio method
ASOS	Automated Surface Observational Site
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BMP	best management practice
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operator
CalARP	California Accidental Release Program
CAPCOA	California Air Pollution Control Officer's Association
CASAC	Clean Air Scientific Advisory Committee
CCAR	California Climate Action Registry
CCFC	Calpine Construction Finance Company, L.P.
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEDD	California Employment Development Department
CEIDARS	California Emission Inventory Development and Reporting System
CEMS	Continuous Emissions Monitoring System
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
CHRIS	California Historical Resources Information System
CHSC	California Health and Safety Code
CNDDB	California Natural Diversity Data Base

CNPS	California Native Plant Society
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CTG	combustion turbine generator
DTSC	Department of Toxic Substances Control
ECP	Erosion Control Plan
EMF	electro-magnetic field
FRAQMD	Feather River Air Quality Management District
g/s	gram(s) per second
GCP	Good Combustion Practices
GHG	greenhouse gas
HAP	hazardous air pollutant
HARP	Hotspots Analysis and Reporting Program
HHV	higher heating value
HRA	Health Risk Assessment
HRSG	heat recovery steam generator
km	kilometer(s)
KOP	key observation point
kV	kilovolt(s)
LAER	Lowest Achievable Emission Rate
lb	pound(s)
LORS	laws, ordinances, regulations, and standards
LOS	levels of service
m/s	meter(s)/ per second
MCR	maximum continuous rating
MEI	Maximum Exposed Individual
MICR	Maximum Impact Cancer Risk
MIR	Maximum Impact Receptor
MMBtu/hr	million Btu per hour
mmscf	million standard cubic feet
MSA	Metropolitan Statistical Area
MUTCD	Manual of Uniform Traffic Control Devices
MW	megawatt(s)
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission

NCCP/HCP	Natural Community Conservation Plan/Habitat Conservation Plan
NED	National Elevation Database
NEIC	Northeastern Information Center
NFPA	National Fire Prevention Association
NHRP	National Register of Historic Places
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOx	oxides of nitrogen
NRCS	Natural Resources Conservation Service
NSR	New Source Review
O_2	oxygen
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PCE	passenger car equivalent
Petition	Petition to Amend
PG&E	Pacific Gas and Electric Company
PM2.5	particulate matter less than 2.5 microns in equivalent diameter
PM10	particulate matter less than 10 microns in equivalent diameter
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
PTO	Permit to Operate
PWL	MW-to-sound power level
REL	Reference Exposure Level
ROG	reactive organic gas
RCRA	Resource Conservation and Recovery Act of 1976
scf	standard cubic feet
SCR	selective catalytic reduction
SEC	Sutter Energy Center
SER	Significant Emissions Rate
SIL	Significant Impact Level
SO_2	sulfur dioxide
SOx	oxides of sulfur

SR	state route
STG	steam turbine generator
SVAB	Sacramento Valley Air Basin
SWPPP	Stormwater Pollution Prevention Plan
T-BACT	Toxics Best Available Control Technologies
TAC	toxic air contaminant
TCP	Traffic Control Plan
tpy	ton(s) per year
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UCMP	University of California Museum of Paleontology
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compounds
WD	Water district
Western	Western Area Power Administration
WMP	Waste Management Plan

Executive Summary

Calpine Construction Finance Company, L.P. (CCFC) (a wholly owned subsidiary of Calpine Corporation) petitions the California Energy Commission (CEC) to amend the certification for Sutter Energy Center (SEC) (97-AFC-02C). This Petition to Amend proposes the addition of an auxiliary boiler, an expansion of the air-cooled condenser (ACC) by two rows of fans (from six rows to eight rows), and the construction of a new generator tie-line and substation. The purpose of the auxiliary boiler and ACC expansion is to improve operating performance and efficiency. The purpose of the new generator tie-line and substation is to obtain broader access to power markets by creating a direct connection to the California Independent System Operator-controlled grid.

The new generator tie-line would be constructed underground and would extend from the existing onsite 230-kilovolt (kV) switchyard for approximately 1.71 miles south and west to a new 25- to 35-acre substation site located adjacent to the Pacific Gas and Electric Company's (PG&E) Table Mountain-to-Tesla 500 kV transmission line. CCFC would construct, own, and operate a bank of 230 to 500 kV step-up transformers on 3 to 5 acres adjacent to the new substation site. PG&E would design and construct the substation at a later date and would own and operate the substation.

After constructing the new generator tie-line and substation, CCFC will discontinue use of the existing approximately 3.9-mile aboveground 230 kV generator tie-line that connects SEC to Western Area Power Administration's (Western) O'Banion Substation, located approximately 2.3 miles to the southwest. Western owns and operates this line. Although CCFC has stated its preference to remove the existing generator tie-line, under the terms of CCFC's agreement with Western, CCFC is permitted to do so only at Western's direction.

SEC requests only minor changes to the Conditions of Certification set forth in the 1999 certification, as amended, for Air Quality and Biological Resources.

SECTION 1.0

Introduction

1.1 Overview of Modifications

Calpine Construction Finance Company, L.P. (CCFC) (a wholly owned subsidiary of Calpine Corporation) petitions the California Energy Commission (CEC) to amend the certification for Sutter Energy Center (SEC) (97-AFC-02C). The Application for Certification (AFC) for this project was filed in December 1997 (Calpine, 1997) and it received CEC certification on April 14, 1999 (CEC, 1999) as the Sutter Power Project. CCFC subsequently petitioned the CEC for a facility name change to Sutter Energy Center. SEC began operation in July 2001.

SEC is located approximately 7 miles southwest of Yuba City, Sutter County, California, along South Township Road in a rural area that is surrounded by orchards to the east and rice fields to the west (Figures 1-1 and 1-2). SEC is a 578-megawatt (MW), natural-gas-fired, combined-cycle facility. The design consists of two combustion turbine generators (CTG), two heat recovery steam generators (HRSG) with duct burners, and a steam turbine generator (STG). SEC is inter-connected with the Western Area Power Administration's (Western's) 230-kilovolt (kV) transmission system at the O'Banion Substation, which is located approximately 2.3 miles southwest of the SEC site via an aboveground, 3.9-mile-long, 230 kV generator tie-line. SEC occupies approximately 16 acres of a 38.02-acre CCFC-owned parcel. Adjacent and to the east of SEC is a cogeneration facility called Greenleaf 1 that is permitted and operated separately from SEC and occupies a separate, 39.5-acre parcel.

This Petition to Amend (Petition) proposes two equipment modifications to the SEC facility and the addition of a new 1.71-mile-long generator tie-line and a substation that will allow connection to Pacific Gas and Electric Company's (PG&E) Table Mountain-to-Tesla 500 kV transmission line that is located west of the SEC site.

1.1.1 Equipment Modifications

The following equipment modifications are proposed:

Auxiliary Boiler

- CCFC proposes to install an auxiliary boiler adjacent to one of the HRSGs. The auxiliary boiler will provide steam to both HRSGs and improve operating performance.

Air-cooled Condenser

- CCFC proposes to increase the capacity of the air-cooled condenser by adding two rows ("streets") of five fans each. This upgrade will improve the facility's heat rate.

1.1.2 Interconnection Modifications

CCFC's existing generator tie-line connects SEC to Western's O'Banion Substation, which is located approximately 2.3 miles southwest of SEC (Figure 1-2). Because Western is no longer a California Independent System Operator (CAISO) participant, however, this interconnection no longer allows SEC direct access to a broad array of suitable power markets throughout California. For this reason, CCFC is proposing to construct a new, underground replacement generator tie-line and substation that would connect with PG&E's Table Mountain-to-Tesla 500 kV transmission line and would facilitate power marketing to the CAISO-controlled grid that serves much of California. The new generator tie-line would exit the SEC site at the existing switchyard, and then travel west, south, and west along agricultural roads that provide access to rice fields for approximately 1.71 miles to a new substation location adjacent to PG&E's 500 kV Table Mountain-to-Tesla transmission line. PG&E will construct the new substation on a 25- to 35-acre site in the approximate location shown in Figure 1-2 that is currently occupied by a rice field and duck hunting blinds, and CCFC will install a bank of step-up transformers on a 3- to 5-acre site adjacent to the new PG&E substation to transform power from 230 kV to 500 kV for export on the PG&E line. The first point of interconnection with the CAISO-controlled grid will be the PG&E bus on the high side of the CCFC transformers. The new substation will be designed, constructed, owned, and operated by PG&E under authorization from the California Public Utilities Commission. Nevertheless, this Petition considers the environmental effects of the new substation because it is a direct consequence of constructing the new generator tie-line.

After completing the new generator tie-line and substation, CCFC will discontinue use of the existing 230 kV generator tie-line that connects the facility to the O'Banion Substation. Western owns and operates this line. Although CCFC has stated its preference to remove the existing generator tie-line, under the terms of CCFC's agreement with Western, CCFC is only permitted to do so at Western's direction. Because the O'Banion Substation is integrated with Western's broader transmission system, it is likely that Western will continue to operate this facility.

A detailed description of the proposed modifications and generator tie-line addition is included in Section 2.0.

1.2 Information Requirements for the Post-certification Amendment

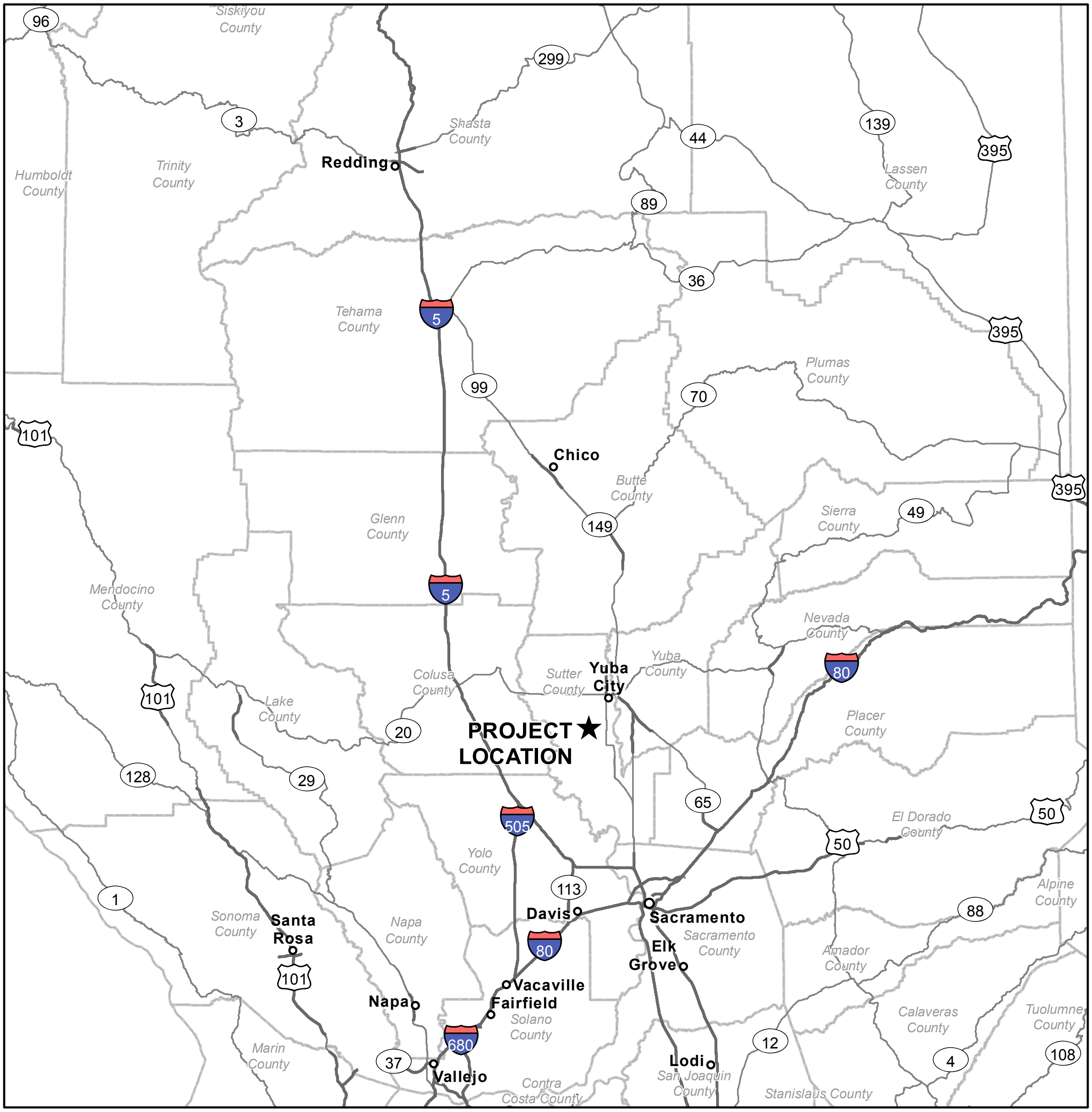
This Petition contains all of the information that is required pursuant to the CEC's Siting Regulations (California Code of Regulations [CCR] Title 20, Section 1769, Post Certification Amendments and Changes). The information necessary to fulfill the requirements of Section 1769 is contained in Sections 1.0 through 6.0, as summarized in Table 1.0-1.

TABLE 1.0-1
Informational Requirements for Post-Certification Modifications

Section 1769 Requirement	Section of Petition Fulfilling Requirement
(A) A complete description of the proposed modifications, including new language for any conditions that will be affected	Section 2.0—Proposed modifications Sections 3.1 to 3.15—Proposed changes to Conditions of Certification, if necessary, are located at the end of the technical section
(B) A discussion of the necessity for the proposed modifications	Section 1.3
(C) If the modification is based on information that was known by the petitioner during the certification proceeding, an explanation why the issue was not raised at that time	Section 1.3
(D) If the modification is based on new information that changes or undermines the assumptions, rationale, findings, or other bases of the final decision, an explanation of why the change should be permitted	Sections 1.4, 3.0
(E) An analysis of the impacts the modification may have on the environment and proposed measures to mitigate any significant adverse impacts	Section 3.0
(F) A discussion of the impact of the modification on the facility's ability to comply with applicable laws, ordinances, regulations, and standards;	Section 3.15
(G) A discussion of how the modification affects the public	Section 4.0
(H) A list of property owners potentially affected by the modification	Section 5.0
(I) A discussion of the potential effect on nearby property owners, the public and the parties in the application proceedings.	Section 6.0

1.3 Ownership of the Facility Property

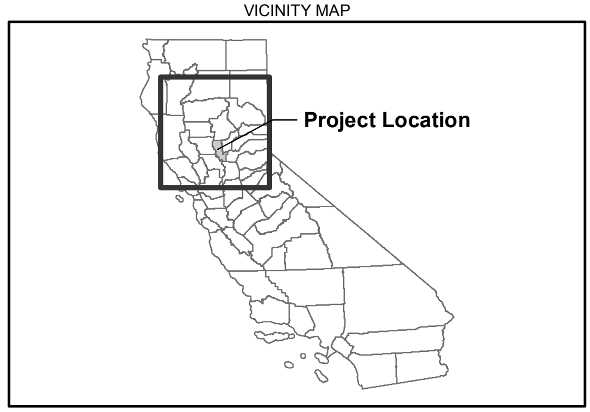
CCFC owns the SEC site and generating facilities and will own and operate the new generator tie-line and the step-up transformers located on a 3- to 5-acre site adjacent to the new PG&E substation. PG&E will design, construct, own, and operate the new 25- to 35-acre 500 kV substation.



LEGEND

★ Project Location

County Boundary



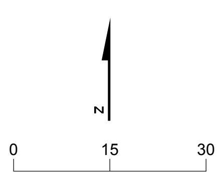
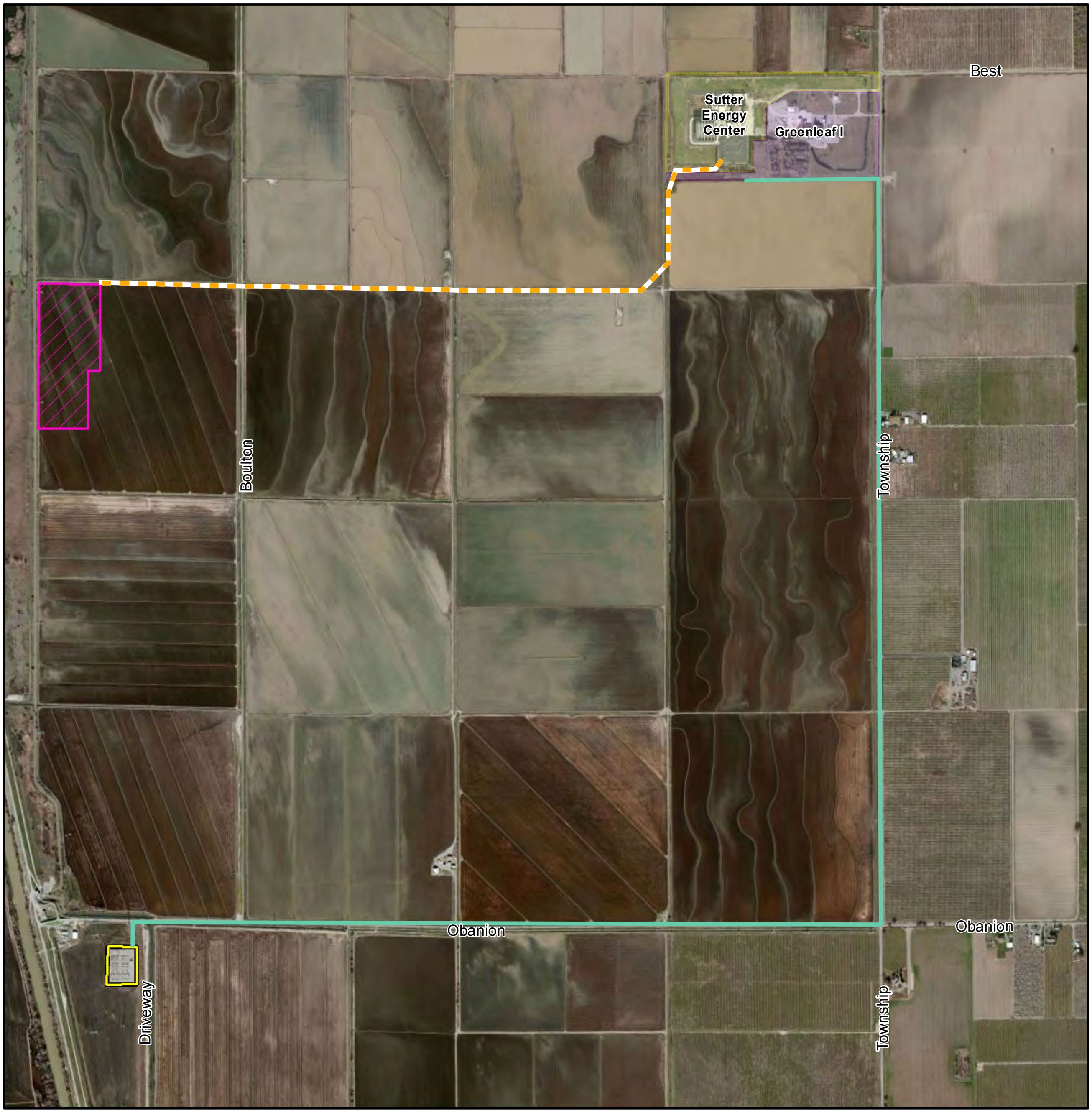


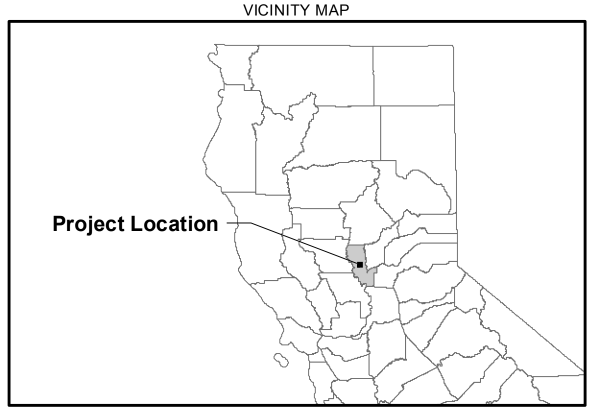
FIGURE 1-1
Project Location
Sutter Energy Center



LEGEND

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation
- Existing Aboveground Generator Tie-Line
- Proposed Underground Generator Tie-Line

VICINITY MAP



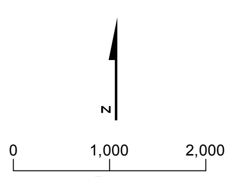


FIGURE 1-2
Project Features
Sutter Energy Center

1.4 Necessity of Proposed Changes

The Siting Regulations require a discussion of the necessity for the proposed revision to the SEC certification and whether the modification is based on information known by the petitioner during the certification proceeding (Title 20, CCR, Sections 1769 [a][1][B] and [C]).

- This Petition to Amend requests approval to implement equipment modifications that will allow the facility to operate and perform more efficiently.
- Because Western is no longer a CAISO participant, as was the case when Calpine submitted the AFC in 1997, SEC is no longer directly interconnected with its most suitable markets and must transmit its output through Western's transmission system to reach the CAISO system. This has resulted in less power marketing flexibility. To address this change, CCFC proposes to construct a new underground generator tie-line and substation to connect directly with the CAISO-controlled grid at PG&E's Table Mountain-to-Tesla 500 kV transmission line. This new generator tie-line will allow SEC direct access to markets in the CAISO control area, which covers most of California.

1.5 Consistency of Changes with Certification

The Siting Regulations also require a discussion of the consistency of the proposed project revision with the applicable laws, ordinances, regulations, and standards (LORS) and whether the modifications are based on new information that changes or undermines the assumptions, rationale, findings, or other basis of the final decision (Title 20, CCR Section 1769 [a][1][D]). If the project is no longer consistent with the certification, the Petition to Amend must provide an explanation why the modification should be permitted.

The proposed project revisions are consistent with the purpose of the project and applicable LORS as described in the Commission Decision. This Petition to Amend is not based on new information that changes or undermines any basis for the Final Decision. The findings and conclusions contained in the Commission Decision for SEC (CEC, 1999) and subsequent license amendments, are still applicable to the project, as modified.

1.6 Summary of Environmental Impacts

The CEC Siting Regulations require that an analysis be conducted to address the potential impacts the proposed modifications may have on the environment, and proposed measures to mitigate any potentially significant adverse impacts (Title 20, CCR, Section 1769 [a][1][E]). The regulations also require a discussion of the impact of the modification on the facility's ability to comply with applicable LORS (Section 1769 [1][a][F]). Section 3.0 of this Petition includes a discussion of the potential environmental impacts associated with the modifications, as well as a discussion of the consistency of the modification with LORS. Section 3.0 also includes updated environmental baseline information if changes have occurred since the AFC that would have a bearing on the environmental analysis of the Petition. Section 3.0 concludes that there will be no significant environmental impacts associated with implementing the actions specified in the Petition and that the project as modified will comply with all applicable LORS.

1.7 Conditions of Certification

SEC requests only minor changes to the Conditions of Certification set forth in the 1999 certification, as amended, for Air Quality and Biological Resources.

1.8 References

California Energy Commission (CEC). 1999. *Energy Commission Decision, Application for Certification for the Sutter Power Plant Project, Docket Number 97-AFC-2*. California Energy Commission, Sacramento, California. April.

Calpine Corporation. 1997. *Application for Certification for Sutter Power Plant Project*. Submitted by Calpine Corporation, San Jose, California. Submitted to California Energy Commission, Sacramento, California. December.

SECTION 2.0
Description of Project Modifications

This section includes a description of the proposed project modifications, consistent with CEC Siting Regulations (Title 20, CCR, Section 1769 [a][1][A]). The project changes will include equipment modifications and interconnection modifications.

2.1 Equipment Modifications

The proposed equipment modifications are described below. The locations on the SEC site where the equipment modifications will take place are shown in Figure 2-1, General Arrangement.

2.1.1 Auxiliary Boiler

Addition of a natural-gas-fired auxiliary boiler allows the plant to keep certain operating systems sufficiently warm making it possible to reduce startup times. Steam from the auxiliary boiler would be used for steam seals, HRSG sparging, and hotwell heating. The auxiliary boiler will allow SEC to maintain condenser vacuum overnight or to pre-establish condenser vacuum prior to starting the combustion turbine. It will also allow SEC, when starting, to ramp up combustion turbine operation without holds by enabling turbine bypass valve operation immediately upon HRSG steam production. The auxiliary boiler will also provide a source of steam to start the fuel gas heater, and for high-pressure drum pre-warming on cold starts.

2.1.2 Air-cooled Condenser Expansion

CCFC proposes to expand the current ACC by installing two additional rows, or “streets,” of five fans each to take advantage of the full output of the steam turbine during higher ambient temperature conditions. This will enhance vacuum in the condenser, which will improve the heat rate. The ACC currently contains six streets of five fans each, for a total of 30 fans. The modified ACC will contain eight streets and a total of 40 fans. The ACC will be expanded to the west. This will require the realignment of the existing plant perimeter fence line and service road approximately 80 feet to the west. The area into which the ACC and road will expand is covered in ruderal vegetation and lies inside the existing SEC parcel boundary. This area was used in constructing the facility as laydown and work area, and the environmental impacts of ground disturbance in this area were considered in the 1997 AFC.

2.2 Interconnection Modifications

CCFC will install a new underground generator tie-line and step-up transformers to interconnect with a new substation that PG&E will design, construct, and own in the approximate location shown in Figure 1-2. The generator tie-line and substation will connect SEC with the CAISO system at PG&E’s Table Mountain-to-Tesla 500 kV line. The new generator tie-line will be approximately 1.71 miles long and will be installed underground. It will extend from the existing 230 kV switchyard located on the SEC facility site south for approximately 170 feet to the southeast, crossing a drainage canal to the southern part of the CCFC parcel. The route then runs for approximately 475 feet to the west before turning south to follow an agricultural road for approximately 1,200 feet, where it then runs on a northeast-to-southwest diagonal for approximately 500 feet through a rice field, crossing drainage and irrigation canals. The route then turns west onto a rice field farm access road and extends to the west on this road for 6,700 feet to a point where it enters the northeast corner of the substation property, crossing two additional irrigation canals and Boulton Road.

The line will be directly buried underground in an open-cut trench to the new substation. The trench will be approximately 6 feet wide at the bottom and 8 feet wide at the top, to accommodate six transmission cables and conduits for fiber-optic cable. The trench will be between 6 and 9 feet deep. The cables will be encased in a weak concrete mix with protective tile laid over the concrete, and a suitable backfill material up to the existing grade. Every 2,000 feet or so, it will be necessary to install cable splice to connect separate source spools of cable. The line will emerge from underground at the north end of the substation site, where it will connect with the step-up transformers, which will, in turn, connect to the PG&E switch gear.

The generator tie-line will be constructed in single-lane rice field access roads that are approximately 12 feet wide, with 6-foot-wide shoulders. Along the entire route, these roads are bordered on one side by agricultural irrigation or drainage canals and on the other side by rice fields. The generator tie-line right-of-way easement will be 20 feet wide and will encompass the access road. During construction, the work area will be 60 feet wide, including the 20-foot-wide right-of-way easement. The work area, however, will extend entirely to the east (north-south segment) or south (east-west segment) of the tie-line easement to avoid the irrigation and drainage canals, which would impede work and are considered sensitive species habitat (see Section 3.2).

Generator tie-line construction will involve undercrossing the three irrigation canals referenced above and Boulton Road. The canals are owned and maintained by the Sutter Extension Water District (WD). During construction, the project owner will maintain flows across the canal undercrossing work areas using a combination of gravity flow and pumps, when necessary, so that there is no interruption of canal flow during construction. The constructor would then install sheathing to temporarily block flow in the canals and dewatering them for generator tie-line trench excavation, followed by removal of sheathing. For each crossing, construction will take approximately 10 days, as follows:

- Install temporary sheathing – 2 days
- Dewater section – 1 day
- Excavate trench– 2 days
- Install cables – 1 day
- Install weak concrete mix around cables – 1 day
- Install concrete tiles, marker tape and build up and compact to level of bottom of canal – 2 days
- Remove temporary sheathing – 1 day

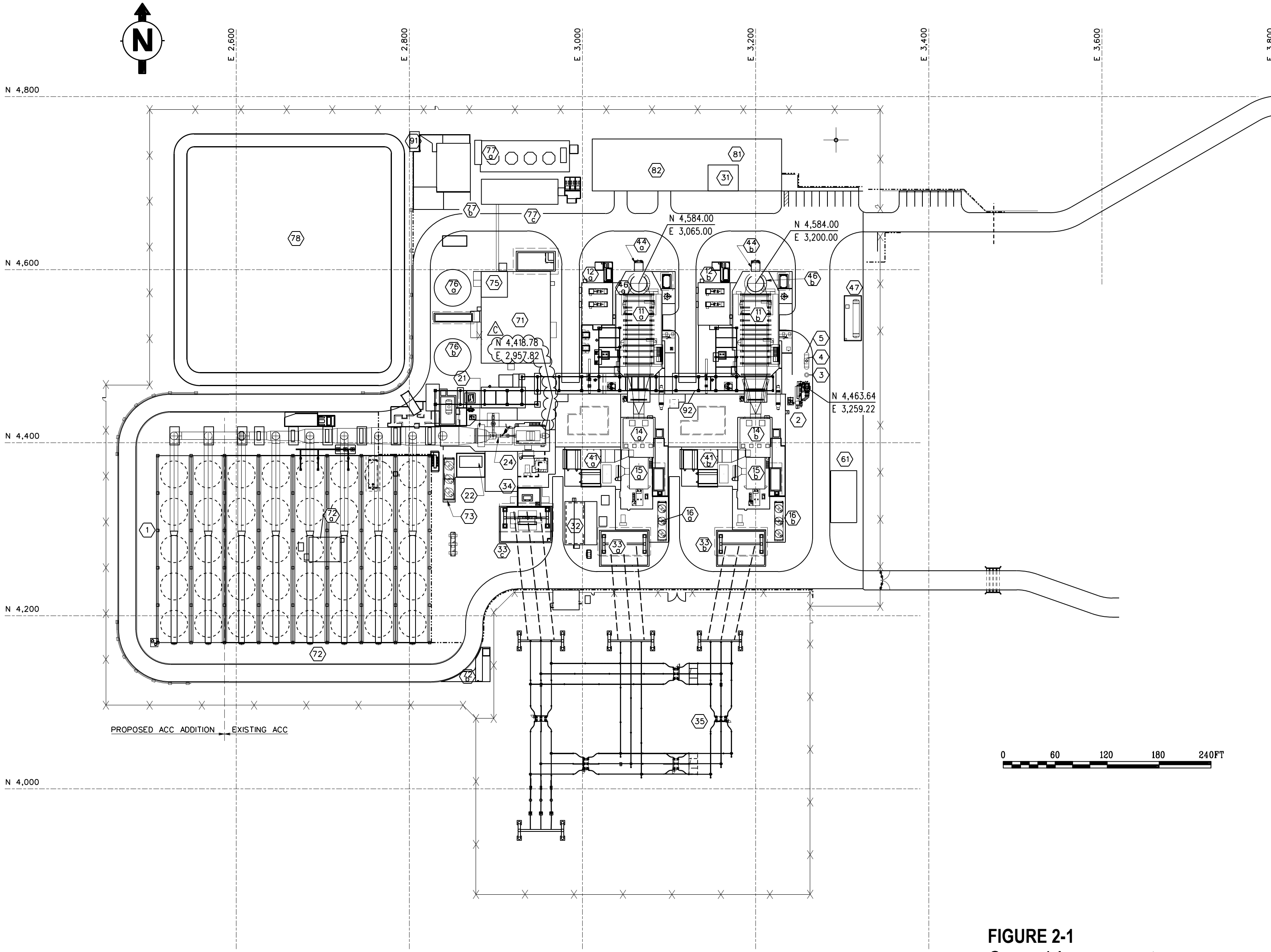
CCFC will coordinate closely with the Sutter Extension WD to minimize any potential disruptions to canal operations. Except for the CEC's sole jurisdiction over the permitting of thermal power plants with a nominal generating capacity of more than 50 MW and their appurtenances up to the first point of interconnection, Sutter Extension WD would issue encroachment permits for these generator tie-line canal crossings and would require preparation of documentation required under the California Environmental Quality Act (CEQA) to address the potential environmental impacts of issuing the permit. The CEC's Staff Assessment and Decision documents, however, can serve as the CEQA compliance documents for Sutter Extension WD because the CEC's licensing process is a Certified Regulatory Program and is therefore functionally equivalent to CEQA.

The substation will be located in what is currently a rice field with duck hunting blinds that is adjacent to the PG&E Table Mountain-to-Tesla 500 kV transmission line. Adjacent to the substation, CCFC will construct a bank of step-up transformers that will step up the voltage from 230 kV to 500 kV to deliver power to PG&E's 500 kV system. PG&E will design, construct, own, and operate the substation.

PG&E has not designed the new substation, but has indicated that it will be a 500 kV breaker-and-a-half substation with two 500 kV breaker-and-a-half bays, a control building, and a pair of 500 kV bus sectionalizing switches to separate two entities.

After constructing the new generator tie-line and step-up transformers, CCFC will discontinue use of the existing 230 kV aboveground generator tie-line that connects SEC to Western's system at the O'Banion Substation, approximately 2.3 miles to the southwest. Western owns and operates this generator tie-line. Although CCFC has stated its preference to remove the existing generator tie-line, under the terms of CCFC's agreement with Western, CCFC is only permitted to do so at Western's direction.

The generator tie-line route extends through Township 14N Range 2E Sections 23 and 24. The new substation would be located in Section 23.



LEGEND	
No.	NEW EQUIPMENT
1	AIR COOLED CONDENSER ADDITION
2	AUXILIARY BOILER
3	BLOWDOWN TANK
4	AUX BOILER FEED PUMPS
5	DEAERATOR
No.	EXISTING EQUIPMENT
11a	HEAT RECOVERY STEAM GENERATOR (HRSG) 1
11b	HEAT RECOVERY STEAM GENERATOR (HRSG) 2
12a	BOILER FEED PUMPS 1
12b	BOILER FEED PUMPS 2
14a	COMBUSTION TURBINE 1
14b	COMBUSTION TURBINE 2
15a	COMBUSTION TURBINE GENERATOR 1
15b	COMBUSTION TURBINE GENERATOR 2
16a	LUBE OIL COOLER 1
16b	LUBE OIL COOLER 2
21	STEAM TURBINE AREA
22	STEAM TURBINE LUBE OIL SKID
24	STEAM TURBINE
31	CONTROL ROOM
32	SWITCHGEAR BLDG W/ BATTERY ROOM
33a	C.T. MAIN TRANSFORMER 1
33b	C.T. MAIN TRANSFORMER 2
33c	S.T. MAIN TRANSFORMER
34	AUXILIARY TRANSFORMER
35	SWITCHYARD
41a	AIR INLET FILTER 1
41b	AIR INLET FILTER 2
44a	CONTINUOUS EMISSIONS MONITORING SYSTEM 1
44b	CONTINUOUS EMISSIONS MONITORING SYSTEM 2
46a	STACK 1
46b	STACK 2
47	AMMONIA TANK
61	GAS REGULATING AREA (BY OTHERS)
71	WATER TREATMENT BLDG/LABORATORY
72	AIR COOLED CONDENSER
72a	AIR COOLED CONDENSER ELECTRICAL BUILDING
72b	AIR COOLED CONDENSER OIL STORAGE AREA
73	LUBE OIL COOLER
75	FIRE WATER AND SERVICE WATER PUMP AREA
76a	FILTERED/FIRE WATER STORAGE TANK
76b	DEMINERALIZED WATER STORAGE TANK
77a	WASTE WATER BASIN
77b	CRYSTALLIZER
77c	EVAPORATOR SYSTEM
78	STORM WATER DETENTION/RETENTION AREA
81	ADMINISTRATION BLDG
82	WAREHOUSE/MAINTENANCE SHOP
91	SEWAGE TREATMENT PLANT
92	PIPE RACK

Source: WorleyParsons, Ltd., Drawing CASU-0-SK-111-002-001 Rev. A

FIGURE 2-1
General Arrangement
Sutter Energy Center

2.3 Transmission System

CCFC has applied to the CAISO to connect SEC with the CAISO-controlled grid under the CAISO's Federal Energy Regulatory Commission-approved generator interconnection procedures. CCFC's proposal is a member of the PG&E North Area Cluster 1/Cluster 2 queue cluster. CAISO has conducted a Cluster 1/Cluster 2 Phase II study to determine the combined impact of all the Cluster 1, Cluster 2, and small generator interconnection procedures Transition Cluster projects (C1-C2 projects) on the CAISO controlled-grid. The study assesses what the impacts would be of adding Cluster 1/Cluster 2 projects to the grid and also assesses SEC's impacts individually. The PG&E North Area Cluster 1/Cluster 2 Phase II study is attached to this Petition as Appendix 2.1A. Table 2.3-1 summarizes the required reliability and network upgrades identified in the cluster study.

TABLE 2.3-1
Reliability Network Upgrades Identified as Necessary for SEC's Interconnection

Location of Upgrade	Upgrade
Table Mountain-to-Tesla 500 kV transmission line	Construct new PG&E 500 kV switching station that will connect with the new SEC generator tie-line
Table Mountain Substation	Change relay settings
Tesla Substation	Change relay settings and modify existing remedial action scheme
Vacaville Grid Control Center	Implement remedial action scheme
San Francisco Control Center	Implement remedial action scheme
500 kV System Coordination	Modify and coordinate existing remedial action scheme
Transmission Line Upgrades	Install two (2) new HVS towers, install a minimum of two (2) new additional HVS towers based on switching station location, and remove one (1) HVS tower
Overstressed Circuit Breakers	Replace three (3) 525 kV circuit breakers (CB 542, CB 632, CB 642)
500 kV Series Capacitors	Install approximately 15 ohm series capacitors on at the new 500 kV switching station

SECTION 3.0

Environmental Analysis of Proposed Project Modifications

The following sections provide environmental analyses for each of 14 different discipline areas that address:

- Significant changes to the project area environmental baseline if these changes have taken place since the certification was granted and have a bearing on the environmental impact analyses for the amended facility
- Significant changes to environmental impacts of the facility that are a result of the equipment modifications or new generator tie-line and substation

Each section includes an environmental analysis, followed by a list of any changes to the Conditions of Certification that are necessary because of the proposed project modifications, provided as a text mark-up.

The environmental disciplines are addressed in alphabetical order, as follows:

3.1 Air Quality
3.2 Biological Resources
3.3 Cultural Resources
3.4 Geology and Paleontology
3.5 Hazardous Materials Management
3.6 Land Use
3.7 Noise and Vibration
3.8 Public Health
3.9 Socioeconomics
3.10 Soil and Water Resources
3.11 Traffic and Transportation
3.12 Visual Resources
3.13 Waste Management
3.14 Worker Safety and Fire Protection

Table 3.0-1 identifies the proposed modifications, indicating which will require discussion of potential effects under the various disciplines discussed in the licensing proceeding. For ease of readability, those items not identified as impacting a discipline will not be addressed in each of the individual disciplines.

TABLE 3.0-1
Proposed Project Changes and Affected Environmental Disciplines (C=Construction, O=Operation)

	Aux Boiler and ACC Expansion	New Generator Tie-line
3.1 Air Quality	C/O	C
3.2 Biological Resources	—	C/O
3.3 Cultural Resources	—	C
3.4 Geology and Paleontology	—	C
3.5 Hazardous Materials Management	—	—
3.6 Land Use	—	—
3.7 Noise and Vibration	C/O	—
3.8 Public Health	C/O	C
3.9 Socioeconomics	C/O	C/O

TABLE 3.0-1
Proposed Project Changes and Affected Environmental Disciplines (C=Construction, O=Operation)

	Aux Boiler and ACC Expansion	New Generator Tie-line
3.10 Soil and Water Resources	C	C
3.11 Traffic and Transportation	C	C
3.12 Visual Resources	O	O
3.13 Waste Management	C	C
3.14 Worker Safety and Fire Protection	C/O	C/O

3.1 Air Quality

This section presents the evaluation of emissions and impacts resulting from the implementation of equipment and interconnection modifications proposed for SEC. The analysis was prepared in accordance with the California Energy Commission (CEC) power plant siting regulations, and the rules and regulations of the Feather River Air Quality Management District (FRAQMD).

Air quality and meteorology were addressed in the 1997 AFC and during the 2011 SEC license amendment proceeding for the Grimes Pipeline. The installation of the auxiliary boiler and the expansion of the ACC introduce minor changes to the air emissions profile of SEC and will require a modification of SEC's permit to operate (PTO) issued by FRAQMD and a minor permit revision to SEC's prevention of significant deterioration (PSD) permit issued by U.S. Environmental Protection Agency (USEPA) Region 9. The following provides an assessment of the potential effects on air quality from the project modifications. This analysis also provides an update of the environmental baseline in terms of the region's attainment of the National and California Ambient Air Quality Standards (AAQS).

In addition, SEC proposes to remove two parts of the CEC License Condition AQ-32, which currently limits the duration of the quarterly and annual startup/shutdown hours in total. In its place, SEC proposes that no limits on the number of startups/shutdowns on a quarterly and annual basis be placed in the Condition of Certification. SEC will monitor, with a continuous emissions monitoring system (CEMS) and fuel use, the quarterly and annual emissions during these events in order to demonstrate compliance with the quarterly and annual emission limits.

The following technical appendices are also referenced throughout this section:

- Appendix 3.1A - Emissions Calculations and Support Data
- Appendix 3.1B - Modeling Support Data
- Appendix 3.1C - Modeling Protocol
- Appendix 3.1D - Construction Emissions and Support Data
- Appendix 3.1E - Best Available Control Technology (BACT) Analysis
- Appendix 3.1F - Offset/Mitigation Support Data
- Appendix 3.1G - Cumulative Emissions Data
- Appendix 3.1H - FRAQMD Permit Application Forms

In addition, Appendix 3.9A contains support data for the quantified air toxics emissions and health risk analysis presented in Section 3.9 and referenced herein.

3.1.1 Environmental Baseline Information

Sutter County is part of the Sacramento Valley Air Basin, surrounded by the Coastal Mountain Range to the west, the Sierra Nevada to the east, the Cascade Range to the north, and the San Joaquin Valley Air Basin to the south. The Sacramento Valley has a moderate Mediterranean climate, which is characterized by hot, dry summers and cool, rainy winters. The annual average rainfall is approximately 17 inches.

During the summer, the Pacific storm track is usually north of the Sacramento Valley, the afternoon temperatures are warm to hot, while nights are usually mild due to cool marine air intrusion from the San Francisco Bay Area. Meteorological data collected at the Sacramento Executive Airport (which is over 30 miles away from SEC) indicate that July is usually the warmest month of the year, with a normal daily maximum temperature of 93°F, and a normal daily minimum of 59°F. In the fall and spring, the afternoon temperatures are mild, in the 60s and 70s°F, while nights are cool, in the 40s and 50s. In the winter, temperatures are cool in the afternoon and crisp at night. The coldest month is usually January, with a normal daily maximum of 53°F and a normal daily minimum of 38°F. The recorded high temperature is 115°F and the recorded low temperature is 18°F. The prevailing wind is southerly during most of the year. However, in November and December, a large north to south pressure gradient develops over Northern California and northerly winds prevail. Wind directions are often influenced by the topography of the Central Sacramento Valley and the surface pressure gradient between the coast and the Valley.

3.1.1.1 Background Air Quality

In 1970, the United States Congress instructed the USEPA to establish standards for air pollutants, which were of nationwide concern. This directive resulted from the concern of the effects of air pollutants on the health and welfare of the public. The resulting Clean Air Act (CAA) set forth air quality standards to protect the health and welfare of the public. Two levels of standards were promulgated—primary standards and secondary standards. Primary national ambient air quality standards (NAAQS) are "those which, in the judgment of the administrator [of the USEPA], based on air quality criteria and allowing an adequate margin of safety, are requisite to protect the public health (state of general health of community or population)." The secondary NAAQS are "those which in the judgment of the administrator [of the USEPA], based on air quality criteria, are requisite to protect the public welfare and ecosystems associated with the presence of air pollutants in the ambient air." To date, NAAQS have been established for seven criteria pollutants as follows: sulfur dioxide (SO_2,), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sub 10-micron particulate matter (PM10), sub 2.5-micron particulate matter (PM2.5), and lead.

The criteria pollutants are those that have been demonstrated historically to be widespread and have a potential to cause adverse health impacts. USEPA developed comprehensive documents detailing the basis of, or criteria for, the standards that limit the ambient concentrations of these pollutants. The State of California has also established AAQS that further limit the allowable concentrations of certain criteria pollutants. Review of the established air quality standards is undertaken by both USEPA and the State of California on a periodic basis. As a result of the periodic reviews, the standards have been updated, i.e., amended, over the ensuing years to the present.

Two basic elements comprise each federal or state AAQS: (1) a numerical limit expressed as an allowable concentration, and (2) an averaging time which specifies the period over which the concentration value is to be measured. Table 3.1-1 presents the current federal and state AAQS.

Brief descriptions of health effects for the main criteria pollutants are as follows:

Ozone—Ozone is a reactive pollutant that is not emitted directly into the atmosphere, but rather is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving precursor organic compounds such as volatile organic compounds (VOC) and oxides of nitrogen (NO_x). VOC and NO_x are, therefore, known as precursor compounds for $O_{3.}$ Significant O_3 production generally requires O_3 precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of VOC and NO_x under the influence of wind and sunlight. Short-term exposure to O_3 can irritate the eyes and cause constriction of the airways. In addition to causing shortness of breath, O_3 can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.

Carbon Monoxide—Carbon monoxide is a non-reactive pollutant that is a product of incomplete combustion. Ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic and are also influenced by meteorological factors such as wind speed and atmospheric mixing. Under inversion conditions, carbon monoxide concentrations may be distributed more uniformly over an area out to some distance from vehicular sources. When inhaled at high concentrations, carbon monoxide combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses.

TABLE 3.1-1
State and Federal Ambient Air Quality Standards

Pollutant	Averaging Period	California Standards Concentration	Form of the California Standards	National Standards Concentration	Form of the Federal Standards
Ozone	1-hour	0.09 ppm (180 µg/m^3)	Not to be exceeded	—	—
	8-hour	0.070 ppm (137 µg/m^3)	Not to be exceeded	0.075 ppm (147 µg/m^3)	3-year average of annual 4th-highest daily maximum
Carbon monoxide	8-hour	9.0 ppm (10,000 µg/m^3)	Not to be exceeded	9 ppm (10,000 µg/m^3)	Not to be exceeded
	1-hour	20 ppm (23,000 µg/m^3)	Not to be exceeded	35 ppm (40,000 µg/m^3)	Not to be exceeded
Nitrogen dioxide	Annual Average Mean	0.030 ppm (57 µg/m^3)	Not to be exceeded	0.053 ppm (100 µg/m^3)	Not to be exceeded
	1-hour	0.18 ppm (339 µg/m^3)	Not to be exceeded	0.100 ppm (188 µg/m^3)	3-year average of annual 98th percentiles
Sulfur dioxide	Annual Average Mean	—	Not to be exceeded	0.03 ppm (79 µg/m^3)[a]	Not to be exceeded
	24-hour	0.04 ppm (105 µg/m^3)	Not to be exceeded	0.14 ppm (367 µg/m^3)[a]	Not to be exceeded
	3-hour	—	Not to be exceeded	0.5 ppm (1300 µg/m^3)[b]	Not to be exceeded
	1-hour	0.25 ppm (655 µg/m^3)	Not to be exceeded	0.075 ppm (196 µg/m^3)	Not to be exceeded
Respirable particulate matter (10 micron)	24-hour	50 µg/m^3	Not to be exceeded	150 µg/m^3	Not to be exceeded
	Annual Average Mean	20 µg/m^3	Not to be exceeded	—	Not to be exceeded
Fine particulate matter (2.5 micron)	Annual Average Mean	12 µg/m^3	Not to be exceeded	15 µg/m^3 (3-year average)	Not to be exceeded
	24-hour	—	Not to be exceeded	35 µg/m^3	3-year average of 98th percentiles
Sulfates	24-hour	25 µg/m^3	Not to be equaled or exceeded	—	—
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	Not to be equaled or exceeded	—	—
Lead	30-day average	1.5 µg/m^3	Not to be equaled or exceeded	—	—
	Calendar quarter	—	Not to be equaled or exceeded	1.5 µg/m^3	—
	Rolling 3-month average	—	Not to be equaled or exceeded	0.15 µg/m^3	—

[a]Not applicable in certain areas, including FRAQMD’s jurisdiction
[b]Secondary standard (not used in background air quality determination)

µg/m^3 =- micrograms per cubic meter
ppm = parts per million

Source: California Air Resources Board (ARB) website, 060712.

Particulate Matter (PM10 and PM2.5)—PM10 consists of particulate matter that is 10 microns or less in diameter (a micron is 1 millionth of a meter), while PM2.5, or fine particulate matter, consists of particulate matter 2.5 microns or less in diameter. Both PM10 and PM2.5 represent fractions of particulate matter, which can be inhaled into the air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. Some of these operations, such as demolition and construction activities, contribute to increases in local PM10 concentrations, while others, such as vehicular traffic, affect regional PM10 concentrations.

NAAQS for particulate matter were first established in 1971. The standards covered total suspended particulate matter (TSP), or particles that are 30 microns or smaller in diameter. In 1987, USEPA changed the standards from TSP to PM10 as the new indicator. The new standards were based on a comprehensive study of information on the health effects from inhaling particulate matter. In December 1994, the USEPA began a long review process to determine if the PM10 standards set in 1987 provide a reasonable margin of safety, and if a new standard should be established for finer particles.

Based on numerous epidemiological studies and other health- and engineering-related information, USEPA established new standards for PM2.5 in 1997. Before establishing the new PM2.5 standards, discussions were conducted with the Clean Air Scientific Advisory Committee (CASAC). CASAC is a group of nationally recognized experts in the fields related to air pollution, environmental health, and engineering. CASAC reviewed and commented on the information generated by USEPA regarding proposed particulate matter standards.

Subsequent to these discussions and reviews, USEPA established PM2.5 standards of 35 $\mu g/m^3$, 24-hour average concentration, and 15 $\mu g/m^3$, annual average concentration. USEPA also confirmed the national PM10 standards of 150 $\mu g/m^3$, 24-hour average, as providing an adequate margin of safety for limiting exposure to larger particles. The annual standard of 50 $\mu g/m^3$ has been deleted by USEPA. The recommendations for new PM2.5 standards and for maintaining the PM10 standards were released in a staff report that presents the conclusions of the USEPA and of the CASAC review committee.

Several studies that USEPA relied on for its staff report have shown an association between exposure to particulate matter, both PM10 and PM2.5, and respiratory ailments or cardiovascular disease. Other studies have related particulate matter to increases in asthma attacks. In general, these studies have shown that short-term and long-term exposure to particulate matter can cause acute and chronic health effects. PM2.5, which can penetrate deep into the lungs, causes more serious respiratory ailments.

Nitrogen Dioxide and Sulfur Dioxide—Nitrogen dioxide and SO_2 are two gaseous compounds within a larger group of compounds, NO_x and oxides of sulfur (SO_x), respectively, which are products of the combustion of fuel. NO_x and SO_x emission sources can elevate local NO_2 and SO_2 concentrations, and both are regional precursor compounds to particulate matter. As described above, NO_x is also an O_3 precursor compound and can affect regional visibility. (NO_2 is the "whiskey brown-colored" gas readily visible during periods of heavy air pollution.) Elevated concentrations of these compounds are associated with increased risk of acute and chronic respiratory disease.

SO_2 and NO_x emissions can be oxidized in the atmosphere to eventually form sulfates and nitrates, which contribute to acid rain. Large power plants with high emissions of these substances because of the use of coal or oil are subject to emissions reductions under the Phase I Acid Rain Program of Title IV of the 1990 CAA Amendments. Power plants, with individual equipment capacity of 25 MW or greater that use natural gas or other fuels with low sulfur content, are subject to the Phase II Program of Title IV. The Phase II program requires plants to install CEMS in accordance with the Code of Federal Regulations (40 CFR Part 75) and report annual emissions of SO_x and NO_x.

Lead—Gasoline-powered automobile engines used to be the major source of airborne lead in urban areas. Excessive exposure to lead concentrations can result in gastrointestinal disturbances, anemia, and kidney disease, and, in severe cases, neuromuscular and neurological dysfunction. The use of lead additives in motor vehicle fuel has been eliminated in California, and lead concentrations have declined substantially as a result.

At the time of SEC's original permitting through the FRAQMD in 1999, the Sacramento Valley Air Basin in which SEC is located, was classified as follows for the various state and federal air quality standards (Table 3.1-2).

TABLE 3.1-2
Sacramento Valley Criteria Pollutant Attainment Status at Time of Initial Permitting

Pollutant	Federal Status	State Status
NO_2	Attainment/unclassified	Attainment/unclassified
CO	Attainment/unclassified	Attainment/unclassified
SO_2	Attainment/unclassified	Attainment/unclassified
Ozone-North	No Status	Non-attainment
Ozone-South	Serious Non-attainment	Serious Non-attainment
PM10	Attainment	Moderate Non-attainment
Lead	Attainment/unclassified	Attainment/unclassified

Based on the regional air quality status at the time of initial permitting, the facility was subject to PSD review for NO_x, CO, and PM10. SEC was considered a major source for purposes of PSD review for both NO_x and CO (i.e., exceeded threshold of 100 tons per year [tpy] of each pollutant). In addition, since the PM10 emissions were above the significant emission rate (SER) of 15 tpy, PSD applied to this pollutant as well. The FRAQMD New Source Review (NSR) rule applied to all the pollutants. The facility is not a major source of hazardous air pollutants (HAP).

Table 3.1-3 presents the current status of FRAQMD for the various state and federal air quality standards.

TABLE 3.1-3
Current Sacramento Valley Air Basin Criteria Pollutant Attainment Status

Pollutant	Federal Status	State Status
NO_2	Attainment/unclassified	Attainment
CO	Attainment/unclassified	Attainment/unclassified
SO_2	Unclassified/attainment	Attainment
Ozone-North 8 Hr	No Status	NA-Transitional
Ozone-South 8 Hr	Severe non-attainment	
PM10	Unclassified	Non-attainment
PM2.5	Non-attainment	Attainment
Lead	—	Attainment

Note: Shading indicates no change from 1999

A comparison of Tables 3.1-2 and 3.1-3 indicates that few substantial changes have occurred with respect to attainment status for PSD permitting purposes. Pollutant PM2.5 has been designated "non-attainment" in this region. Based on the ARB California Emission Inventory Development and Reporting System (CEIDARS) PM fractions for natural gas used in internal combustion emissions sources (such as turbines/duct burners), PM2.5 is approximately 99.8% of PM10, or approximately 92.22 tpy on a potential to emit (PTE) basis. The remaining changes are mostly terminological.

3.1.1.2 Current SEC Facility Description

SEC is currently operating under a FRAQMD PTO/Title V permit issued on July 30, 2010. SEC was also subject to permitting under the federal PSD regulations. The USEPA Region 9 staff issued the SEC PSD permit on July 21, 1999. This permit was subsequently modified and re-issued on December 29, 2000, and August 16, 2004, respectively.

The existing 578 MW combined cycle facility uses two combustion turbine generators (CTG) exhausting into HRSGs. Steam generated in the two HRSGs powers a steam turbine generator. Air pollutants are controlled using a dry-low NO_x combustor, selective catalytic reduction (SCR), and oxidation catalyst technologies.

The following major equipment is currently in operation at SEC:

- Two Siemens Westinghouse 501FC combustion turbine generators with a nominal rating of 185 MW each
- One Siemens Westinghouse steam turbine generator with a nominal rating of 180 MW
- Two HRSGs with a capacity of approximately 463,769 lb/hr of high pressure steam
- Two duct burners, each with a firing capacity of 170 million btu per hour (MMBtu/hr) high heating value (HHV)
- Air-cooled condenser (unit with 30 fans)
- CEMS for NO_x, oxygen (O_2), and carbon monoxide (CO)
- Emission control systems on the CTGs/HRSGs include: dry low-NO_x combustors; SCR to control NO_x; oxidation catalyst to control CO and VOC
- The facility combusts pipeline quality natural gas only

3.1.1.3 Current SEC Facility Emissions

Table 3.1-4 shows the current SEC facility emissions limits as presented on the various permits and certifications, including the FRAQMD PTO/Title V permit, the USEPA PSD Permit, and the CEC Decision.

TABLE 3.1-4
Facility Emissions Limits by Agency

Parameter*	FRAQMD PTO/Title V	USEPA PSD Permit	CEC Decision	Comment
NO_x, ppm	2.5	2.5	2.5	Maximum normal full load firing mode
CO, ppm	4	4	4	
VOC, ppm	1	n/s	1	
SO_2, ppm	1	n/s	1	
NO_x, lb/hr	19.1	19.1	n/s	Maximum normal full load firing mode, excludes startup and shutdown
CO, lb/hr	34.3	34.3	n/s	
VOC, lb/hr	3.51	n/s	n/s	
SO_2, lb/hr	4.02	n/s	n/s	
PM10, lb/hr	11.5	11.5	11.5	
PM2.5, lb/hr	n/s	n/s	n/s	
NO_x, lb/day	1817	n/s	1817	Facility total maximum normal full load firing mode, includes startup and shutdown
CO, lb/day	6528	n/s	6528	
VOC, lb/day	158	n/s	158	
SO_2, lb/day	179	n/s	179	
PM10, lb/day	541	n/s	541	
PM2.5, lb/day	n/s	n/s	n/s	

TABLE 3.1-4
Facility Emissions Limits by Agency

Parameter*	FRAQMD PTO/Title V	USEPA PSD Permit	CEC Decision	Comment
NO_x, tpy	205.0	n/s	205.0	Facility total, which includes all operational modes
CO, tpy	483.2	n/s	483.2	
VOC, tpy	23.7	n/s	23.7	
SO_2, tpy	31.5	n/s	31.5	
PM10, tpy	92.4	n/s	92.4	
PM2.5, tpy	n/s	n/s	n/s	
Max startup hrs/qtr	102	n/s	102	Applicable to each turbine/HRSG power train
Max shutdown hrs/qtr	76	n/s	76	
Max startup hrs/yr	400	n/s	400	
Max shutdown hrs/yr	300	n/s	300	
NO_x offsets, tpy	205.0	n/s	205	Offsets surrendered to cover facility total PTE
VOC offsets, tpy	23.7	n/s	23.7	
PM10 offsets, tpy	92.4	n/s	92.4	CEC values not discounted for offset distance ratios

*unless otherwise specified the data presented is for each CTG/HRSG power train.
All ppm values (for the turbines) are referenced to 15% O_2 dry.
Startup and shutdown emissions values, i.e., lb/hr or lb/event are not delineated here, see current PTO.
PM10, per ARB CEIDARS, is assumed to be 99.4% of total PM, while PM2.5 is assumed to be 99.8% of PM10.
Offset values have been applied to the facility to mitigate the maximum allowable emissions (tpy) by the FRAQMD
n/s = not specified by agency

Total facility emissions, in tpy for each pollutant, reported by SEC for the years 2007–2011 are presented in Table 3.1-5.

TABLE 3.1-5
Reported Facility Actual Emissions by Year and Pollutant

Year/Pollutant	NO_x	CO	VOC	SO_x	PM10
2007	84.95	22.1	5.54	5.65	19.05
2008	95.73	33.25	3.65	6.15	20.30
2009	77.34	41.63	3.27	3.91	16.96
2010	66.25	49.20	3.41	3.95	14.69
2011	43.67	55.28	2.38	2.09	5.06

A comparison of the values in Table 3.1-5 to the tpy limit values in Table 3.1-4 shows that the facility is operating below its annual PTE limits. It should also be noted that the facility has supplied verified offsets for NO_x, VOCs, and PM10 at levels that are equal to the PTE values in the FRAQMD PTO/Title V permit.

Presently, there are no conditions or limits pertaining to greenhouse gas (GHG) emissions on any of the agency permits or certifications. GHG PTE for the current facility was estimated using the California Climate Action Registry (CCAR) default factors (Ver 3.1, January 2009) for natural gas combusted in turbines/duct burners and the annual fuel use limits presented in the FRAQMD PTO/Title V permit. The current GHG PTE for the facility is estimated to be approximately 2,091,271.5 tons per year.

3.1.2 Environmental Consequences

Based on the results of an air dispersion modeling analysis, installation and operation of the new auxiliary boiler will result in an increase in emissions from operations at the site. Criteria pollutant emissions from the auxiliary boiler and ACC expansion are delineated in the following sections, while emissions of HAPs are delineated in the Public Health portion of this analysis (Section 3.9).

3.1.2.1 Project Modifications, Auxiliary Boiler

SEC proposes to install and operate a natural-gas-fired auxiliary boiler to provide steam to the HRSGs, improve operating performance, and reduce the turbine startup times. By reducing startup times, the proposed auxiliary boiler will decrease emissions on a lb/hr and lb/event basis and will be designed as follows:

- Manufacturer: Rentech (or equivalent)
- Heat rating: 130.33 MMBtu/hr
- Fuel: natural gas only
- Exhaust flow rate: approximately 38,502 actual cubic feet per minute (acfm)
- Exhaust temperature: approximately 300°F
- Stack height: 45 feet
- Stack diameter: 44 inches
- Steam production: 100,000 lb/hr

Appendix 3.1A presents the boiler specification data in detail. Table 3.1-6 shows the proposed fuel use quantities for the auxiliary boiler.

TABLE 3.1-6
Estimated Fuel Use Summary for the Proposed Auxiliary Boiler

System	Units	Per Hour	Per Day	Per Year
Auxiliary Boiler	mmscf	0.1290	3.096	1032.32

Natural gas at 1,010 Btu/scf HHV per Rentech spec sheet (Appendix 3.1A)
Daily fuel use is based on maximum operation, 24 hrs/day (at 25-100% of maximum continuous rating [MCR]).
mmscf = million standard cubic feet

Table 3.1-7 presents a typical natural gas composition analysis for the Sutter County area.

TABLE 3.1-7
Typical Natural Gas Fuel Analysis

Component	Analysis (Average)
Methane	96.444%
Ethane	1.652%
Propane	0.266%
Butanes, Pentanes, Hexanes	0.1204%
Nitrogen (N_2)	0.28%
CO_2	1.239%
Sulfur	0.003 lb SO_x/MMBtu
Btu/scf	~1010 (HHV)

The auxiliary boiler will not operate during the periods when one or both CTGs are operational. The auxiliary boiler may operate during the first phases of turbine startup and so was included in the dispersion modeling analysis described below. No changes to the existing turbine/HRSG operations or emissions are proposed. To allow for maximum flexibility, however, the auxiliary boiler modeled emissions are based on 8,760 hours per year of operation.

3.1.2.2 Project Modifications, Air-Cooled Condenser

Addition of 10 fans to the existing ACC unit, bringing the total number of fans from 30 to 40 fans, will not result in any emissions increases of PM10/2.5. No other emissions are expected to result from the addition of the 10 fans to the existing ACC unit.

3.1.2.3 Emission From Operation of the Facility, as Modified

Operation of the proposed auxiliary boiler will result in emissions to the atmosphere of both criteria pollutants and toxic air pollutants. Criteria pollutant emissions will consist primarily of NO_x, CO, VOCs, SO_x, and PM10/PM2.5. Air toxic pollutants will consist of a combination of toxic gases and toxic particulate matter species. Table 3.1-8 lists the pollutants that will be potentially emitted from the proposed modification.

TABLE 3.1-8

Criteria and Toxic Pollutants Potentially Emitted from SEC

NO_x	Benzene
CO	1,3-Butadiene
VOC	Ethylbenzene
SO_x	Formaldehyde
PM10/PM2.5	Hexane
Ammonia	Naphthalene
Polycyclic Aromatic Hydrocarbons (PAH)	Propylene
Acetaldehyde	Toluene
Acrolein	Xylene

Table 3.1-9 presents the estimated emissions for the proposed auxiliary boiler.

TABLE 3.1-9

Emissions from the Proposed Auxiliary Boiler

Pollutant	Lb/Hour	Lb/Day	Lb/Quarter	Tons/Year
NO_x[a]	0.73	17.52	1670	3.34
NO_x[b]	1.12	18.28	n/a	n/a
CO	4.82	115.73	10,560	21.12
VOC	0.52	12.51	1145	2.29
SO_x	0.39	9.38	860	1.72
PM10	0.91	21.9	1995	3.99
PM2.5	0.91	21.9	1995	3.99
carbon dioxide equivalent (CO_2e)	—	—	—	66,955

[a]NO_x emissions for steady state operations.
[b]NO_x emissions for worst case hour and day including startups and shutdowns

Maximum operation hours per day = 24 (including startups and shutdowns)
Maximum operation hours per year = 8,760 (including startups and shutdowns)
Quarterly emissions are based on the annual values apportioned equally over 4 quarters.

The proposed auxiliary boiler will potentially undergo startup and shutdown two times per day for an annual total of 730 startups and 730 shutdowns. Emissions from startups and shutdowns are included in the annual emissions totals, as well as the hourly and daily values (Table 3.1-9).

Table 3.1-10 compares the potential to emit for the existing plant to the calculated potential to emit for the plant after addition of the auxiliary boiler.

TABLE 3.1-10
Potential to Emit Comparison of the Current Site Emissions Profile to the SEC, as Modified

Pollutant	Current Facility PTE (tpy)	PTE with Auxiliary Boiler Added (tpy)	Current Facility/Aux. Boiler Difference in PTE[a] (tpy)	FRAQMD Offsets Required (tpy)
NO_x	205	208.34	3.34	3.34
CO	483.2	504.32	21.12	0
VOC	23.7	25.99	2.29	2.29
SO_x	31.5	33.22	1.72	0
PM10	92.4	96.39	3.99	3.99
PM2.5	92.22[b]	96.21	3.99	0
CO_2e	2,091,271.5	2,158,227	66955	0

[a]Approximate emissions increases (+) and decreases (-). Auxiliary boiler only, the addition of 10 fans to the existing ACC unit has no impact on PM10/2.5 emissions.
[b]PM2.5 calculated, assuming 99.8% of PM10 is PM2.5.

Based on the values in Tables 3.1-9 and 3.1-10, the proposed plant modification will be a minor modification under FRAQMD Rule 10.1. Detailed emissions data on the auxiliary boiler modification is presented in Appendix 3.1A. For a project that involves the addition of a new emissions unit(s), the determination of whether PSD is triggered is calculated by reference to the potential to emit of the new emissions units (40 CFR § 52.21(a)(2)(iv)(d)). The emissions of greenhouse gases attributable to the addition of the auxiliary boiler (CO_2e) will not trigger the PSD program requirements under the provisions of the Tailoring Rule adopted by USEPA. In addition, the plant will not be required to undergo PSD review for NO_x, CO, VOC, SO_x, and PM10 because the increase in each of these attainment/unclassifiable pollutants attributable to addition of the auxiliary boiler is well below the PSD SERs. The plant will be required to obtain emissions offsets pursuant to the FRAQMD NSR rules for the emissions increases of PM10, NO_x, and VOCs, but offsets will not be required for PM2.5. The proposed criteria pollutant mitigation strategy for the facility, as modified, is discussed in Appendix 3.1F.

3.1.2.4 Best Available Control Technology Evaluation

Table 3.1-11 presents the BACT summary for the proposed new auxiliary boiler. A detailed BACT evaluation is provided at Appendix 3.1E.

TABLE 3.1-11
Proposed BACT for the Auxiliary Boiler (normal operations)

Pollutant	Proposed BACT Emissions Level	Proposed BACT System(s)	Meets Current BACT Requirements
NO_x	5 ppm, 0.0056 lb/MMBtu	Low NO_x burner/flue gas recirculation with SCR	Yes
CO	50 ppm, 0.037 lb/MMBtu	Good combustion practices (GCPs)	Yes
VOC	10 ppm, 0.004 lb/MMBtu	Natural gas fuel/GCPs	Yes
SO_x	0.003 lb/MMBtu	Natural gas fuel/GCPs	Yes
PM10/ PM2.5	0.007 lb/MMBtu	Natural gas fuel/GCPs	Yes
Ammonia Slip	5 ppm	N/A	Yes

See Tables 3.1-8 and 3.1-9 for BACT-related mass emissions values.
PPM values at 3% O_2 dry.

These proposed BACT emissions rates, are consistent with recent BACT determinations, as summarized in the BACT analysis in Appendix 3.1E. A GHG BACT analysis is not required.

Based on the above data, the proposed emissions levels for the auxiliary boiler meet the BACT requirements of the FRAQMD.

The ACC is considered BACT/Lowest Achievable Emission Rate (LAER) for cooling system technology. The addition of fans to the existing unit will not affect or change the current BACT status.

3.1.2.5 Air Quality Dispersion Modeling Analysis

This section describes the methods and results, in both magnitude and spatial extent of ground-level concentrations resulting from emissions from SEC as modified by the auxiliary boiler and ACC expansion. The maximum modeled concentrations were added to the maximum background concentrations to calculate a total impact.

Potential air quality impacts from the project modifications were evaluated based on air quality dispersion modeling, as described herein. All input and output modeling files will be provided on a CD-ROM disk under separate cover. All modeling analyses were performed using the techniques and methods as summarized below:

- USEPA's *Guideline on Air Quality Models* (including supplements)
- USEPA Memorandum *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard* (March 2011)
- USEPA Memorandum *Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard* (August 2010)
- USEPA Memorandum *Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS* (March 2010)
- California Air Pollution Control Officers Association *Modeling Compliance of the Federal 1-Hour NO_2 NAAQS* (Draft Release 2011)
- Federal Land Managers' *Air Quality Related Values Workgroup (FLAG) Phase I Report-Revised* (October 2010)
- *Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Recommendations* (1998) and Additional modeling guidance

Dispersion Analysis

The USEPA dispersion models used to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations include the AERMOD modeling system (version 12345 with the associated receptor processing program AERMAP version 11103) for modeling all plant operational and construction impacts in both simple and complex terrain, the Building Profile Input Program for PRIME (BPIP-PRIME version 04274), and the use of the California Health Risk Assessment models/protocols for determining toxic impacts, which includes the HARP On-Ramp program. The models were used for the following :

- Comparison of operational and construction impacts to significant impact levels (SIL), ambient monitoring significance thresholds, California Ambient Air Quality Standards (CAAQS), and NAAQS
- Toxics analyses using ARB algorithms as incorporated into state/CEC requirements

Modeling Approach

The purpose of the modeling analysis is to demonstrate that air emissions from the new auxiliary boiler, when combined with the existing turbines and background air quality monitoring concentrations, will not cause or contribute to a CAAQS or NAAQS violation and will not cause a significant health risk impact. For modeling the facility's operational impacts on nearby simple and complex terrain, the AERMOD model was used with 5 years of hourly meteorological data.

AERMOD is a steady-state plume dispersion model that simulates transport and dispersion from multiple point, area, or volume sources based on updated characterizations of the atmospheric boundary layer. AERMOD uses Gaussian distributions in the vertical and horizontal for stable conditions, and in the horizontal for convective conditions; the vertical distribution for convective conditions is based on a bi-Gaussian probability density function of the vertical velocity. For elevated terrain, AERMOD incorporates the concept of the critical dividing streamline height, in which flow below a certain height remains horizontal, and flow above this height tends to rise up and over terrain. AERMOD also uses the advanced PRIME algorithm to account for building wake effects.

As part of the input requirements into AERMET and AERMOD, a land use classification must be made. The area surrounding the facility site was determined to be primarily rural following the methods outlined by the Auer land use classification method. As part of the AERMET input requirements, albedo, Bowen ratio, and surface roughness must be classified by season. These values will be determined with the AERSURFACE using the latest USEPA guidance (i.e., AERMOD Implementation Guide, revised January 9, 2008) and the AERSURFACE User's Guide (USEPA-454/B-08-001) as described earlier. AERMOD input data options are listed below following these USEPA modeling guidance documents.

- Final plume rise
- Stack tip downwash
- Regulatory default option (i.e., calm and missing meteorological data processing and elevated terrain heights option)

Flagpole receptors were not used. AERMAP was used to calculate receptor elevations and hill height scales for all receptors from the US Geological Survey's (USGS) National Elevation Database (NED) GeoTIFF data in accordance with USEPA guidance.

Five years (2007–2011) of hourly data collected at the Yuba County Airport (11 kilometers northeast of SEC) were combined with 5 years of upper air data from Oakland International Airport and were input into AERMET for processing. The data were collected as part of the National Weather Service Automated Surface Observational Site (ASOS) site. The surface data were based on one-minute average ASOS data, which were processed with AERMINUTE (version 11325).

As part of the input requirements into AERMET and AERMOD, a land use classification must be made. The area surrounding the plant site, within 3 kilometers (km), can be characterized as rural, made up mostly of in-use agricultural lands, based on review of land use/land cover data as well as recent aerial photo data. In accordance with the Auer land use classification methodology (USEPA's *Guideline on Air Quality Models*, 40 CFR Pt. 51, App. W), land use within the area circumscribed by a 3 km radius around the plant is greater than 90 percent rural. Therefore, in the modeling analyses supporting the permitting of the plant, no urban coefficients were assigned.

AERMOD input data options are listed below:

- Final plume rise
- Stack tip downwash
- Ozone Limiting Method for NO_2
- Regulatory default option (calm and missing meteorological data processing)
- Elevated receptor terrain heights option

Use of these options follows the USEPA's modeling guideline (40 CFR Pt. 51, App. W), FRAQMD guidance, and/or sound scientific practice. An explanation of these options and the rationale for their selection is provided below.

Several other USEPA models and programs were used to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations. The additional models used were Building Profile Input Program for PRIME (BPIP-PRIME, current version 04274) for assessing building dimensions for downwash and the HARP On-Ramp Preprocessor (Version 1.4D), which is used in the health risk assessment.

Federal 1-hour NO_2 NAAQS Modeling. USEPA recently established a new 1-hour NO_2 standard at a level of 100 parts per billion (ppb) (188.68 µg/m^3), based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour concentrations in addition to the existing annual secondary standard (100 µg/m^3). USEPA has also established requirements for an NO_2 monitoring network that will include monitors at locations where maximum NO_2 concentrations are expected to occur, including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO_2 concentrations that occur more broadly across communities.

To assess impacts of the facility, as modified, on compliance with the federal 1-hour NO_2 Standard, the methods summarized in the California Air Pollution Control Officers Association (CAPCOA) Guidance Document *Modeling Compliance of the Federal 1-hour NO_2 NAAQS* (CAPCOA, 2011) were used. Background NO_2 monitoring data were obtained from the Yuba City monitoring station.

California State 1-hour NO_2 Standard. In order to assess compliance with the California state standard for 1-hour NO_2, the plume volume molar ratio method was used with concurrent hourly background NO_2 and O_3 data from the Yuba City monitoring station. The timeframe for the background NO_2 and O_3 monitoring data matched the meteorology used to assess the total NO_2 concentrations. The first high modeled results at each receptor were used for comparisons with the 1-hour standard. The default NO_2/NO_x ratio of 0.5 was used.

Annual NO_2 Standard. The annual average concentrations of NO_2 were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995, Federal Register, 60 FR 40465). The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NO_x ratio.

Good Engineering Practice Stack Height Analysis. SEC currently uses an ACC dry cooling system for the turbine/HRSGs. As part of the proposed modifications, the ACC dimensions will be increased through the addition of 10 fans to the existing 30 fans, which will enable the plant to operate with increased efficiency. This structure is the predominant influence on downwash from the existing turbines and the proposed auxiliary boiler.

Based on the increased size of the ACC, the good engineering practice stack height for the auxiliary boiler is calculated as the greater of 65 meters (285 feet) or 86.87 meters (90 feet) based on existing onsite structure dimensions. The design stack height of 15.24 meters does not exceed good engineering practice stack height, thus downwash effects were included in the modeling analysis.

BPIP-PRIME was used to generate the wind-direction-specific building dimensions for input into AERMOD. All onsite and the nearby offsite structures were included for analysis with BPIP-PRIME. The building location plan, located in Appendix 3.1B, shows the buildings included in the downwash analysis. (USEPA 1985d, 1985e)

Receptor Grid Selection and Coverage. Receptor and source base elevations were determined from the USGS National Elevation Dataset (NED) data in the GeoTIFF format at a horizontal resolution of 1/3 arc-second (approximate 10 meter spacing). Because of the format of the NED data, all coordinates (both sources and receptors) were referenced to Universal Transverse Mercator (UTM) North American Datum 1983 (NAD83, Zone 11). Elevation locations in the NED dataset were interpolated by AERMAP to normal UTM locations appropriate for the receptor grid spacings shown below.

Cartesian coordinate receptor grids are used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. The receptor grids used in this analysis are as follows:

- 10-meter resolution grid along the facility fence line
- 20-meter resolution grid that extends outwards from the fence line to 500 meters in all directions. This is referred to as the downwash grid
- 50-meter resolution grid that extends outwards from the edge of the downwash grid to 1,000 meters in all directions. This is referred to as the intermediate grid
- 100-meter resolution grid that extends from the edge of the intermediate grid outwards in all directions to 2,000 meters

- 1,000-meter resolution grid that extends from the edge of the 100-meter grid outwards 10,000 meters in all directions
- 10-meter resolution around any location outside the downwash grid where a maximum impact is modeled. These additional receptors are referred to as refined grids

Concentrations within the plant fence line will not be calculated. The coarse and fine receptor grid figure, located in Appendix 3.1B, displays the receptors grids used in the modeling assessment. A plant boundary figure is also presented in Appendix 3.1B.

Meteorological Data Selection

The proposed use of the 5 years of surface meteorological data collected at the Yuba County Airport would satisfy the definition of onsite data. USEPA defines the term “on-site data” to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates from the CAA in section 165(e)(1), which requires an analysis “of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility.” This requirement and USEPA’s guidance on the use of on-site monitoring data are also outlined in the *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* (USEPA, 1987). The representativeness of meteorological data is dependent upon: (a) the proximity of the meteorological monitoring site to the area under consideration; (b) the complexity of the topography of the area; (c) the exposure of the meteorological sensors; and (d) the period of time during which the data are collected (USEPA, 1985c).

The meteorological monitoring site and SEC are in close proximity (11 km), at approximately the same elevation and with similar topography surrounding each location. The Yuba County Airport and SEC location are also located approximately 11 km from each other and in the same orientation to significant terrain features that define the valley shape and size. Additionally, as discussed below, the surface characteristics roughness length, Bowen ratio, and albedo are relatively consistent throughout the area and are nearly identical between SEC and the airport location.

Representativeness is defined in the document *Workshop on the Representativeness of Meteorological Observations* (Nappo et al., 1982) as “the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application.” Judgments of representativeness should be made only when sites are climatologically similar, as is the case with the meteorological monitoring site and the SEC location. In determining the representativeness of the meteorological data set for use in the dispersion models at the facility site, the consideration of the correlation of terrain features to prevailing meteorological conditions, as discussed earlier, would be nearly identical for both locations because the orientation and aspect of terrain at the SEC location correlates well with the prevailing wind fields as measured by and contained in the meteorological dataset. In other words, the same mesoscale and localized geographic and topographic features that influence wind flow patterns at the meteorological monitoring site also influence the wind flow patterns at the SEC site.

Surface characteristics were determined with AERSURFACE using Land Use/Land Cover data in accordance with USEPA guidance documents (*AERMOD Implementation Guide,* 1/09/08; and *AERSURFACE User’s Guide*, USEPA-454/B-08-001, 1/08) as described below. AERSURFACE uses USGS National Land Cover Data 1992 archives to determine the midday albedo, daytime Bowen ratio, and surface roughness length representative of the surface meteorological station. Bowen ratio is based on a simple unweighted geometric mean, while albedo is based on a simple unweighted arithmetic mean for the 10x10-km-square area centered on the selected location (i.e., no direction or distance dependence for either parameter). Surface roughness length is based on an inverse distance-weighted geometric mean for upwind distances up to 1 km from the selected location. The circular surface roughness length area (1-km radius) can be divided into any number of sectors as appropriate (USEPA guidance recommends that no sector be less than 30 degrees in width). AERMET was executed using 12 30-degree sectors for roughness lengths obtained from AERSURFACE for the Yuba County Airport.

For these reasons, the Yuba County Airport meteorological data selected for the proposed modifications are expected to satisfy the definition of representative meteorological data. Thus, it is our assessment that this meteorological data are identical to the dispersion conditions at SEC and to the region in general.

Air quality monitoring data for the period 2009 through 2011 from several sites surrounding the SEC site are summarized in Table 3.1-12. Data for 2012 were not included because the summary statistics and data verification will not be completed until May 2013. Data from these sites (primarily Sutter, Yuba City, and Sacramento-North Highlands) were used to establish the background levels in Table 3.1-12, and were used in the air quality impact analyses that follow.

TABLE 3.1-12
Air Quality Summary, Most Recent 3 Years

Pollutant	Site	Averaging Time	2009	2010	2011
Ozone, ppm	Sutter	1-hour State	.089	.089	.074
Ozone, ppm	Sutter	8-hour Federal	.075	.068	.075
PM10, $\mu g/m^3$	Yuba City	24-hour	50.7	43.1	54.6
PM10, $\mu g/m^3$	Yuba City	Annual AM State	22.4	16.5	20.5
PM2.5, $\mu g/m^3$	Yuba City	24-hour Federal	41.8	72.2	57
PM2.5, $\mu g/m^3$	Yuba City	Annual AM State	12.2	10.3	13.8
PM2.5, $\mu g/m^3$	Yuba City	Annual AM Federal	7.9	5.9	7.9
CO, ppm	North Highlands	8-hour	1.66	1.16	1.97
CO, ppm	North Highlands	1-hour	2.1	3.1	2.3
NO_2, ppm	Yuba City	1-hour State	.054	.095	.059
NO_2, ppm	Yuba City	1-hour Federal	.044	.047	.042
NO_2, ppm	Yuba City	Annual AM	.01	.009	.009
SO_2, ppm	North Highlands	Annual AM	n/a	n/a	n/a
		24-hour	.002	.002	—
		1-hour Federal	.003	.003	—

Source: ARB ADAM 020813, EPA Airs 020813.

Table 3.1-13 shows the background air quality values based on the data presented in Table 3.1-12. The background values represent the highest or average values reported for the site during any single year of the most recent 3-year period (2009–2011) per the specified “form of the standard” shown in Table 3.1-1. Appendix 3.1B presents the historical background air quality data summaries.

TABLE 3.1-13
Estimated Background Air Quality Values

Pollutant and Averaging Time	Background Value
Ozone – 1 Hour	0.089 ppm (178 μg/m^3)
Ozone – 8 Hour	0.073 ppm (143 μg/m^3)
PM10 – 24 Hour	54.6 μg/m^3
PM10 – Annual	22.4 μg/m3
PM2.5 – 24 Hour	36.5 μg/m^3
PM2.5 – Annual	13.8 μg/m^3
CO – 1 Hour	3.1 ppm (3543 μg/m^3)
CO – 8 Hour	1.97 ppm (2189 μg/m^3)
NO_2 – 1 Hour Federal (based on 98th percentile data analysis)	0.045 ppm (84.6 μg/m^3)
NO_2 – 1 Hour State (based on 1st high data analysis)	0.073 ppm (137.5 μg/m^3)
NO_2 – Annual	0.0083 ppm (15.7 μg/m^3)
SO_2 – 1 Hour	0.003 ppm (7.9 μg/m^3)
SO_2 – 24 Hour	0.002 ppm (5.3 μg/m^3)

Table 3.1-14 summarizes the federal permitting criteria and applicable evaluation thresholds.

Refined Impact Analysis

Facility sources, including the two CTGs/HRSGs and auxiliary natural-gas-fired boiler were modeled in the analysis for comparisons with SILs and CAAQS/NAAQS.

Operational characteristics of the existing CTGs and HRSGs, such as emission rates, exit velocity, and exit temperature were based on the existing PTE permit limits. The auxiliary boiler emission rates and stack parameters were based on vendor data as well as worst-case operational run-time characteristics. The auxiliary boiler will not operate when one or both of the CTGs are operational. However, the auxiliary boiler may operate during the first hour of a turbine startup. Thus, to assess the potential for impacts to the AAQS, the auxiliary boiler was modeled along with the worst-case turbine startup, which would include both turbines starting up during a 1-, 3- or 8-hour period. The startup NO_x emissions from the boiler are slightly higher than during normal operations. In the modeling analysis for NO_2, the startup emissions from the boiler were included with the cold startup emissions from both CTGs/HRSGs.

The existing turbine stack parameters and emission rates during the startup were obtained from the June 11, 2003, permit to amend the startup emission limits. For the startup modeling analyses, both turbines were assumed to start up within the same hour. For longer averaging periods, such as the 3-hour and 8-hour time frames, multiple startups/shutdowns along with full load operation for all engines were modeled in order to calculate the worst-case impacts. Startup turbine $NO_{x,}$ CO, and SO_2 emissions were modeled with worst case stack characteristics based on the load screening analysis in the original permit application. For 24-hour PM10 and PM2.5 along with the 24-hour SO_2 average, the startup and shutdown emissions were automatically included in the regular modeling analyses. Table 3.1-15 shows the stack parameters and emission rates.

Detailed emission calculations for all averaging periods are included in Appendix 3.1A.

TABLE 3.1-14
Federal Program Evaluation Data

Regulated Pollutant	Major Source Thresholds (tpy) PSD	Major Source Thresholds (tpy) NAA	Averaging Time Period	Standard Form	NAAQS Primary µg/m³	NAAQS Primary ppb	NAAQS Secondary µg/m³	NAAQS Secondary ppb	PSD Increments (µg/m³) Area Classifications I	II	III	Significant Emissions Increase	Significant Impact Levels (µg/m³)	Monitoring de minimis Levels (µg/m³)
PM10	250/100	100/70	24 hr	a	150	—	150	—	8	30	60	15	5	10
			Annual	b	—	—	—	—	4	17	34		1	—
PM2.5	250/100	100	24 hr	c	35	—	35	—	2	9	18	10	1.2	4
			Annual	d	15	—	15	—	1	4	8		0.3	—
SO_2	250/100	100	1 hr	g	196	75	—	—	—	—	—	40	7.8*	—
			3 hr	e	—	—	1,300	500	25	512	700		25	—
			24 hr	k	—	—	—	—	5	91	182		5	13
			Annual	k	—	—	—	—	2	20	40		1	—
NO_2	250/100	100	1 hr	j	188	100	—	—	—	—	—	40	7.5	—
			Annual	f	100	53	100	53	2.5	25	50		1	14
Ozone	250/100	100/50 /25/10	8 hr	h	147	75	147	75	—	—	—	40/25/ any	—	—
CO	250/100	100/50	1 hr	e	40,000	35,000	—	—	—	—	—	100	2,000	—
			8 hr	e	10,000	9,000	—	—	—	—	—		500	575
Lead	250/100	100	Calendar Qtr	i	1.5	—	1.5	—	—	—	—	0.6	—	0.1
TSP	250/100	—	—	n/a	—	—	—	—	—	—	—	25	—	—

Standard form notes:
a. 99th percentile, 3 yr average
b. Annual arithmetic mean, 3 yr average
c. 98th percentile, 3 yr average
d. Annual arithmetic mean (single or multiple monitors), 3 yr average
e. Not to be exceeded more than once per calendar year
f. Annual arithmetic mean
g. 99th percentile, 3 yr average, 1 hr daily maximums
h. 3 yr average of 4th highest daily maximum 8 hr concentration
i. Maximum quarterly arithmetic mean
j. 98th percentile, daily 1 hr maximums
k. Standard will be revoked on August 3, 2011

AERMOD was initially used in order to determine the magnitude and location of the maximum impacts for each pollutant and averaging period for comparison with the AAQS. Table 3.1-15 summarizes maximum modeled concentrations for each criteria pollutant and associated averaging periods.

Based on the locations of the maximum impacts, several refined 10-meter resolution receptor grids were developed. The refined receptor grids were prepared for the following pollutants and averaging periods:

- 1-hour NO_2 (state standards)
- 1-hour and 8-hour CO (state standard)

TABLE 3.1-15
Stack Parameters and Emission Rates for Refined AERMOD Modeling

Equipment/ Input Data	Stack Parameters				Emission Rates (g/s)[a]			
	Stack Height (m)	Stack Diameter (m)	Stack Temp. (deg K)	Exhaust Velocity (m/s)	NO_X	SO_2	CO	PM10/2.5
Averaging Period: 1-hour for Turbine Startup Operating Conditions								
Turbine/HRSG 1	56.39	5.49	357.59	13.56	22.050	0.5065	113.65	—
Turbine/HRSG	56.39	5.49	357.59	13.56	22.050	0.5065	113.65	—
Auxiliary Boiler	13.716	1.12	422.04	18.53	0.1411	0.0491	0.6073	—
Averaging Period: 3 hours for Turbine Startup Operating Conditions								
Turbine/HRSG 1	56.39	5.49	357.59	13.56	—	0.5065	—	—
Turbine/HRSG	56.39	5.49	357.59	13.56	—	0.5065	—	—
Auxiliary Boiler	13.716	1.12	422.04	18.53	—	0.0491	—	—
Averaging Period: 8 hours for Turbine Startup Operating Conditions								
Turbine/HRSG 1	56.39	5.49	357.59	13.56	—	—	40.676	—
Turbine/HRSG	56.39	5.49	357.59	13.56	—	—	40.676	—
Auxiliary Boiler	13.716	1.12	422.04	18.53	—	—	0.6073	—
Averaging Period: 24 hours for Turbine Startup/Full Load Operating Conditions								
Turbine/HRSG 1	56.39	5.49	357.59	13.56	—	0.4964	—	1.370
Turbine/HRSG	56.39	5.49	357.59	13.56	—	0.4964	—	1.370
Auxiliary Boiler	13.716	1.12	422.04	18.53	—	0.0491	—	0.1147
Averaging Period: Annual for Normal Operating Conditions								
Turbine/HRSG 1	56.39	5.49	366.48	20.116	2.9486	—	—	1.329
Turbine/HRSG	56.39	5.49	366.48	20.116	2.9486	—	—	1.329
Auxiliary Boiler	13.716	1.12	422.04	18.53	0.0961	—	—	0.1147

[a] Modeled emission rates based on estimated hours of operation (see Appendix 3.1A).
[b] Annual averaging periods include startup/shutdown emissions, where applicable.

g/s = grams per second
m/s = meters per second

The results of the refined grid modeling are presented in Table 3.1-16.

TABLE 3.1-16
Air Quality Impact Summary for Normal Operating Conditions

Pollutant	Avg. Period	Maximum Concentration (μg/m³)	Background (μg/m³)	Total (μg/m³)	Class II Significance Level (μg/m³)	Ambient Air Quality CAAQS/NAAQS (μg/m³)	(μg/m³)
NO_2[a]	1-hour Federal	49.74	84.6	134.34	7.5	-	188
	1-hour State	105.01	137.5	242.51	-	339	-
	Annual	1.18	15.7	16.89	1	57	100
PM10	24-hour	8.19	54.6	62.79	5	50	150
	Annual	1.89	22.4	24.29	1	20	-
PM2.5	24-hour	6.25	36.5	42.75	1.2	-	35
	Annual[b]	1.89	13.8	15.69	0.3	-	15
	Annual[c]	1.89	7.9	9.79	0.3	12	-
CO	1-hour	540.83	3543	4083.83	2000	23,000	40,000
	8-hour	94.28	2189	2283.28	500	10,000	10,000
SO_2	1-hour	8.40	7.9	16.30	7.8	655	196
	3-hour	5.88	7.9	13.78	25	-	1,300
	24-hour	3.51	5.3	8.81	5	105	367

[a]Ambient Ratio Method (ARM) used for annual NO_2 impacts with 75 percent ratio and Ozone Limiting Method (OLM) used for 1-hour NO_2 impacts, with Kearny Mesa NO_2 background included in the modeling results (USEPA-default 2008–2010 hourly-seasonal background used for 1-hour federal NAAQS and SDAPCD-provided 2003–2005 hourly NO_2 concurrent with meteorological data used for 1-hour state CAAQS. The 1-hour SIL is an interim value.

[b]Federal annual PM2.5 standard

[c]State annual PM2.5 standard

Soils and Vegetation

Impacts on soils, vegetation, and sensitive species were determined to be “insignificant” for the following reasons:

- No soils were identified in the SEC area that are recognized to have any known sensitivity to the types or amounts (ambient concentrations) of air pollutants expected to be emitted by the proposed plant. Soil classification was made using data from the National Resources Conservation Service (NRCS). Facility operations would not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during facility operation would be limited to existing roads and plant operations areas, all of which will be paved. Impacts to soil resources from SEC operational emissions would be less than significant. Support data for soils impacts can be found in the original AFC geotechnical report for the SEC site (including soils information).
- No vegetation or sensitive species were identified in the SEC area that are recognized to have any known sensitivity to the types or amounts (ambient concentrations) of air pollutants expected to be emitted by SEC after the proposed modifications. Support data for biological and vegetation/soils impacts can be found in the original AFC biology and soils sections, as well as the amended biology and soils sections.
- SEC emissions are expected to be in compliance with all applicable air quality rules and regulations.
- SEC impacts are not predicted to result in violations of existing air quality standards, nor will the emissions cause an exacerbation of an existing violation of any quality standard.

3.1.2.6 Construction Emissions

Construction-related emissions are expected to be minor and insignificant for the installation of the auxiliary boiler and ACC expansion due to the following:

- The existing site is already graded and leveled, therefore these types of onsite construction activities will be minimal for the auxiliary boiler or the addition of fans to the ACC.
- The auxiliary boiler will be constructed next to one of the HRSGs, with only minor activities such as pad clearance, minimal foundation excavation, and pad/foundation construction required.
- The addition of fans to the ACC will require only minimal grading and leveling for the construction of the necessary pads/footings for the cell structures.
- Minimal grading and leveling will be required for the onsite access road re-alignment and fencing adjustments.

Construction-related issues and emissions at the plant site are consistent with issues and emissions encountered at any construction site. Compliance with the provisions of the conditions of certification in the license result in minimal site emissions, which will require compliance with the provisions of all applicable fugitive dust rules that pertain to the site construction phase. An analysis of construction site emissions is presented in Appendix 3.1D. This analysis incorporates the following mitigation measures or control strategies:

- Construction equipment exhaust emissions will comply with all applicable USEPA and California emissions standards for each equipment type and category.
- Construction equipment will use only California-certified diesel (low sulfur, low aromatic content) and gasoline fuels.
- Each piece of equipment will be included in a preventative maintenance program to ensure correct operation and to minimize exhaust emissions.
- Equipment use scheduling will minimize equipment onsite time as well as idling time once onsite.
- Water will be used as the primary fugitive dust suppression control method. Water will be applied to all disturbed portions of the site, including unpaved roads, parking and laydown areas, at a minimum of three times daily.
- Track-out sites, if required, will either be swept or water flushed on a daily basis to remove track-out materials from all paved access roads.
- Vehicle speeds will be generally limited to 5 miles per hour onsite.
- Reasonable erosion control strategies will be implemented to prevent soil and silt runoff from the site.
- Disturbed areas will be revegetated as soon as practical.
- All trucks entering or leaving the site will cover all loads of soils, sands, and other loose materials, or each truck will provide a minimum freeboard height of 2 feet.
- Water or chemical surface stabilizers will be used on any storage piles or identified wind erosion areas.

Use of these mitigation measures and control strategies will ensure that the site does not cause any violations of existing air quality standards as a result of construction-related activities (MRI, 1996; SCAQMD, 1993).

3.1.3 Mitigation Measures

Based on the modeling results, emissions from SEC, with the new auxiliary boiler, will not significantly affect the attainment status of the airshed or cause any new exceedances of air quality standards, and will comply with all ambient air quality standards. As stated above, SEC will be required to obtain emissions offsets pursuant to the FRAQMD NSR rules for the emissions increases of PM10, NO_x, and VOCs, but offsets will not be required for

PM2.5. The proposed criteria pollutant mitigation strategy for the facility, as modified, is discussed in Appendix 3.1F. Table 3.1-10 identifies the offsets required.

3.1.4 Consistency with LORS

Although FRAQMD rules otherwise require an applicant to obtain an Authority to Construct prior to construction of any emissions source, state law provides that the CEC's issuance of license shall be in lieu of any permit or similar document required by any other state or local agency (Cal. Health & Saf. Code § 25500). Accordingly, FRAQMD Rule 10-1 (I.3 and I.4) provides that, for power plants subject to the CEC's jurisdiction, the Air Pollution Control Officer shall consider the AFC to be equivalent to an application for an Authority to Construct during the Determination of Compliance review, and shall apply all provisions of the District rules and regulations which apply to applications for an Authority to Construct. FRAQMD Rule 10-1 provides that, upon CEC's issuance of license and confirmation that the source complies with all license and Determination of Compliance conditions, the source shall be issued a Permit to Operate.

PSD review will not be triggered for the project modifications under the Tailoring Rule[1] due to its emissions of GHGs. The project modifications will not be subject to PSD review for those attainment/unclassifiable criteria pollutants because none of these pollutants is emitted at levels exceeding the PSD SERs. However, SEC will obtain, and USEPA Region 9 will issue, a minor amendment to SEC's existing PSD permit, authorizing construction of the auxiliary boiler.

Table 3.1-17 presents a summary of local, state, and federal LORS deemed applicable to the proposed modification.

TABLE 3.1-17
Applicable LORS for Air Quality

Regulation Citation	Compliance Strategy/Determination
Federal	
CAAA of 1990, 40 CFR 50	Plant operations will not cause violations of state or federal AAQS.
40 CFR 52.21	Facility, as modified, is not subject to full PSD review; but, USEPA will need to approve a minor permit revision to SEC's PSD permit authorizing construction of the auxiliary boiler. Impact analysis demonstrates Facility will not cause exceedance of NAAQS or increments; BACT analysis demonstrates facility will meet BACT for all PSD pollutants.
40 CFR 72-75	Title IV Acid Rain – requires Title IV permit and compliance with acid rain provisions. Facility currently has a Title IV permit and will work towards timely submittal of information to EPA for any permit revisions, changes in allocations, or MRR requirements.
40 CFR 60	Applicant will determine new source performance standard (NSPS) subpart applicability and comply with all emissions, monitoring, and reporting requirements. Potentially applicable subparts are: Subpart Db.
	Imposition of BACT as delineated herein and compliance with the BACT emissions limits as stated in Table 3.1-10 will insure compliance with Subpart Db.
40 CFR 70	The facility currently has a valid Title V permit, and will submit all information as required by FRAQMD to process the required revisions to the current permit.
40 CFR 68	The current facility RMP will be reviewed and revised as necessary.
40 CFR 63	Presently, there are no identified NESHAPs subparts applicable to the facility processes.

1 Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule; Final Rule, 75 Federal Register (Fed. Reg.) 31,514 (June 3, 2010).

TABLE 3.1-17
Applicable LORS for Air Quality

Regulation Citation	Compliance Strategy/Determination
State	
CHSC 44300 et seq. (AB 2588)	Applicant will determine applicability, and prepare inventory plans and reports as required. FRAQMD will determine submittal schedules.
CHSC 41700	FRAQMD FDOC and Authority to Construct (ATC) will ensure that no public nuisance results from operation of plant.
Local FRAQMD Regulations	
Rule 3.0	Visible Emissions – use of natural gas will insure compliance with the visible emissions limitations of Rule 3.0.
Rule 3.2	Particulate Matter Concentration - use of natural gas and good combustion practices will insure compliance with the particulate matter emissions limitations (0.3 grs/dscf) of Rule 3.2.
Rule 3.4	Separation of Emissions – the proposed auxiliary boiler installation does not represent a system which constitutes “separation” of emissions.
Rule 3.5	Combination of Emissions - – the proposed auxiliary boiler installation does not represent a system which constitutes “combination” of emissions.
Rule 3.10	Sulfur Oxides - use of natural gas will insure compliance with the sulfur (SO_X) emissions limitations (0.2% or 2000 ppm as SO2) of Rule 3.10.
Rule 3.14	Solvent Degreasing – the current facility meets all requirements of Rule 3.14, no changes to solvent degreasing activities are proposed.
Rule 3.15	Architectural Coatings – the facility currently uses, and will continue to use coatings which comply with Rule 3.15 VOC and/or use limitations.
Rule 3.16	Fugitive Dust – the proposed mitigations as delineated in section 3.1.3.5 and Appendix 3.1-D will insure compliance with the fugitive dust provisions of Rule 3.16 during the construction period.
Rule 3.21	IIC Boilers, Steam Generators, Process Heaters – BACT for NO_x as proposed will insure compliance with the NO_x provisions of Rule 3.21 (0.08 lb NO_x/MMBtu or 70 ppm at 3% O2).
Rule 9.6	Equipment Breakdowns – the current facility has procedures in-place to report and document equipment breakdowns. These procedures are sufficient to comply with Rule 9.6, and they will continue to be implemented for the proposed modifications.
Rule 10.1	New Source Review – this application document and support appendices address the NSR rule requirements.
Rule 10.2	ERC Banking Credit – any required ERCs will be obtained and verified via Rules 10.1 and 10.2. Offsets for NO_x, VOC, and PM10 may be required for the proposed modifications.
Rule 10.3	Title V – the facility has a current Title V permit. The facility will apply for revisions and amendments to the current Title V permit subsequent to installation of the auxiliary boiler pursuant to the timeframes delineated in Rule 10.3.
Rule 10.6	NSPS – the auxiliary boiler will be subject to NSPS Subpart Db. The applicant will coordinate its compliance and reporting efforts with both the AQMD and EPA.
Rule 10.7	Toxics NSR – Section 3.9 outlines the health effects impacts from the proposed auxiliary boiler operation.

Administrative-type rules such as those pertaining to permits, variances, hearing boards, etc., are not listed but are applicable. Most of these rules are listed in Section I-Permit summary of the current facility Title V permit dated 6-30-10.

3.1.5 References

Auer, A. 1978. Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology, AMS*.

California Air Pollution Control Officers Association (CAPCOA). 2011. *Draft California Air Pollution Control Officers Association Guidance Document Modeling Compliance of the Federal 1-hour NO_2 NAAQS*.

California Air Resources Board (ARB). 1999. *Guidance for Power Plant Siting and Best Available Control Technology, PAB-SSD*. July.

California Air Resources Board (ARB). 2009. The 2009 California Almanac of Emissions and Air Quality. ARB, Technical Support Division.

California Air Resources Board (ARB). 2012a. Best Available Control Technology Clearinghouse Program, http://www.arb.ca.gov/bact/bact.htm. December.

California Air Resources Board (ARB). 2012b. California Air Quality Data Statistics, 2009-2011 Data, ADAM Database, http://www.arb.ca.gov/adam, Air Quality Data Branch, Sacramento, California. April.

California Energy Commission (CEC). 2007. California Energy Commission, Energy Demand 2008-2018 Staff Revised Forecast, CEC-200-2007-015-SF2. November.

MACTEC. 2004. Sensitivity Analysis of PVMRM and OLM in AERMOD. September.

MACTEC. 2005. Evaluation of Bias in AERMOD-PVMRM. June.

MRI. 1996. Improvement of Specific Emission Factors (BACM Project No. 1), Final Report. Prepared by Midwest Research Institute for South Coast AQMD. March.

SCAQMD (South Coast Air Quality Management District). 1993. CEQA Air Quality Handbook. April.

U.S. Department of Agriculture Forest Service (USDAFS). 2002. USDA Forest Service Class I Area Information. http://www.fs.fed.us/r6/aq/natarm/r5/. August.

U.S. Environmental Protection Agency (EPA). 1985a. Compilation of Air Pollution Emission Factors, Volume I, Fifth Edition; AP-42.

U.S. Environmental Protection Agency (EPA). 1985b. Guideline for Determination of Good Engineering Stack Height (Technical Support Document for the Stack Height Regulation) (Revised), EPA-450/4-80-023R. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. June.

U.S. Environmental Protection Agency (EPA). 1985c. Onsite Meteorological Program Guidance for Regulatory Model Applications, EPA-450/4-87-013, August.

U.S. Environmental Protection Agency (EPA). 1985d. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, EPA-454/B-95-003a, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. September.

U.S. Environmental Protection Agency (EPA). 1985e. User's Guide to the Building Profile Input Program (Revised), EPA-454/R-93-038, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. February.

U.S. Environmental Protection Agency (EPA). 1987. On-Site Meteorological Program Guidance for Regulatory Modeling Applications. April.

U.S. Environmental Protection Agency (EPA). 1989. 40 CFR Part 51, Appendix W:, Guideline on Air Quality Models and ARB (Reference Document for California Statewide Modeling Guideline. April.

U.S. Environmental Protection Agency (EPA). 1992a. Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. October.

U.S. Environmental Protection Agency (EPA). 1992b. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (USEPA-454/R-92-019), OAQPS.

U.S. Environmental Protection Agency (EPA). 2005. User's Guide for the AERMOD Model, EPA-454/B-03-001, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. September.

Western Regional Climatic Center (WRCC). 2012. California Climate Data—Normals, Means, and Extremes for Sutter County monitoring sites. December.

3.1.6 Conditions of Certification

SEC requests deletion of Items 5 and 6 from Condition of Certification AQ-32, as follows:

AQ-32. The following definitions and limitations shall apply:

(1) CTG startups are defined as the time period commencing with the introduction of fuel flow into the gas turbine and ending at the start of the first hour period when NOx concentrations do not exceed 2.5 ppmvd at 15% O_2 averaged over 1-hour and the CO concentrations do not exceed 4.0 ppm at 15% O_2 averaged over 1 hour.

(2) For each CTG, a startup shall not exceed 360 consecutive minutes.

(3) Shutdowns are defined as the time period commencing with a 15 minute period during which the 15 minute average NOx concentrations exceed 2.5 ppmvd at 15% O_2 or the 15 minute average CO concentration exceeds 4.0 ppm at 15% O_2 and ending when fuel flow to the gas turbine is discontinued.

(4) For each CTG, a shutdown shall not exceed 60 consecutive minutes.

~~(5) The maximum duration of startups per CTG shall be 400 hours per year and 102 hours per calendar quarter.~~

~~(6) The maximum duration of shutdowns per CTG shall be 300 hours per year, and 76 hours per calendar quarter.~~

[no further changes proposed]

3.2 Biological Resources

Biological resources issues were addressed in the 1997 AFC, during the 2011 SEC license amendment proceeding for the Grimes Pipeline, and during agency consultation with CEC, U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW) for SEC and Grimes Pipeline construction. The auxiliary boiler and ACC do not introduce additional kinds of effects to biological resources not already taken into consideration in the AFC and Commission Decision. However, the new generator tie-line and substation involve the potential disturbance of locations not previously considered in either CEC licensing or agency consultation. The following provides a supplemental assessment of the potential effects on biological resources associated with the project modifications. This analysis also provides an update of the environmental baseline in terms of sensitive species database records for the project area.

3.2.1 Environmental Baseline Information

The area surrounding SEC is primarily used for rice production to the west and orchard crops to the east. It is a highly engineered environment that has been farmed for many decades. Much of the area has been leveled or contoured, is crossed by a network of field access roads and irrigation and drainage canals, and supports little non-agricultural wildlife habitat. Although some fields are periodically fallowed, no evidence of the rice fields being rotated to other crops was observed during site surveys conducted January 15, 2013. Land uses in the surrounding area also include the Sutter National Wildlife Refuge and the Sutter Wildlife Management Area, which are located due west and approximately 1.5 miles from the SEC site boundary.

3.2.1.1 Habitat and Vegetation Communities

As described in the AFC, the habitat potentially affected in the generator tie-line and new substation area can be characterized as agricultural (primarily rice cropland) intersected by irrigation drainages, disturbed annual grassland, fencerows, seasonal wetlands, young riparian (along some irrigation drainages), and developed/ industrial (i.e., unpaved farm roads, existing power plant facilities).

3.2.1.2 Field Survey

A field survey was conducted on January 15, 2013, by CH2M HILL biologist Rick Crowe. The purpose of the survey was to identify existing conditions of the habitat and vegetation on the site, evaluate the site's potential to support special-status species, and assess potential impacts from the proposed project modifications. The area surveyed included the area within 1 mile of the new PG&E substation and within 1,000 feet of the proposed generator tie-line. Subsequent field visits were conducted on January 18 and February 21, 2013, mostly for wetland delineation.

Numerous wildlife common to the area were observed during this survey, including waterfowl, raptors, and sign of several different common mammals (see Table 3.2-1).

TABLE 3.2-1
Wildlife Species or Sign Observed In or Near the Sutter Energy Center and Generator Tie-line Route on January 15, 2013

Common Name	Scientific Name	Comments
BIRDS		
Canada goose	*Branta canadensis*	Fly over
Cackling goose	*Branta hutchinsii*	Fly over
Snow goose	*Chen caerulescens*	Fly over
Gadwall	*Anas strepera*	Rice fields
Mallard	*Anas platyrhynchos*	Rice fields
Northern pintail	*Anas acuta*	Rice fields
Northern shoveler	*Anas clypeata*	Rice fields

TABLE 3.2-1
Wildlife Species or Sign Observed In or Near the Sutter Energy Center and Generator Tie-line Route on January 15, 2013

Common Name	Scientific Name	Comments
Cinnamon teal	*Anas cyanoptera*	Rice fields
Green-winged teal	*Anas crecca*	Rice fields
Lesser scaup	*Aythya affinis*	Rice fields
Bufflehead	*Bucephala albeola*	Rice Fields
Ruddy duck	*Oxyura jamaicensis*	Canal
Pied-billed grebe	*Podilymbus podiceps*	Irrigation canal
Eared grebe	*Podiceps nigricollis*	Irrigation canal
Horned grebe	*Podiceps auritus*	Irrigation canal
Double-crested cormorant	*Phalacrocorax auritus*	Fly over
Great blue heron	*Ardea herodias*	Canal and rice fields
Great egret	*Ardea alba*	Canal and rice fields
Snowy egret	*Egretta thula*	Canal
Green heron	*Butorides virescens*	Canal
Black-crowned night-heron	*Nycticorax nycticorax*	Rice field
White-faced ibis	*Plegadis chihi*	Fly over
Tundra swan	*Cygnus columbianus*	Rice fields and flyover
American coot	*Fulica americana*	Canals and rice fields
Killdeer	*Charadrius vociferus*	Edge of rice fields
Wilson’s snipe	*Calidris alpina*	Flyover
Ring-billed gull	*Larus delawarensis*	Rice fields and flyover
California gull	*Larus californicus*	Rice fields
Turkey vulture	*Cathartes aura*	SEC plant site
Northern harrier	*Circus cyaneus*	Foraging rice field
Red-tailed hawk	*Buteo jamaicensis*	Canal, rice fields and perched in trees
American kestrel	*Falco sparverius*	Fly over
Barn owl	*Tyto alba*	Dead individual observed near SEC detention pond
Rock pigeon (Exotic)	*Sterna fosteri*	SEC plant site
Mourning dove	*Streptopelia decaocto*	Fly over
Belted kingfisher	*Archilochus alexandri*	Canal
Northern flicker	*Colaptes auratus*	SEC plant site
Black phoebe	*Sayornis nigricans*	Canal
American crow	*Corvus brachyrhynchos*	Flyover
Barn swallow	*Hirundo rustica*	Flyover
Bushtit	*Psaltriparus minimus*	Canal
Northern mockingbird	*Mimus polyglottos*	SEC plant site
European starling (Exotic)	*Sturnus vulgaris*	Flyover
Song sparrow	*Melospiza melodia*	Canal and SEC plant site

TABLE 3.2-1
Wildlife Species or Sign Observed In or Near the Sutter Energy Center and Generator Tie-line Route on January 15, 2013

Common Name	Scientific Name	Comments
Golden-crowned sparrow	*Zonotrichia atricapilla*	Canal and SEC plant site
White-crowned sparrow	*Zonotrichia leucophrys*	Canal and SEC plant site
Red-winged blackbird	*Agelaius phoeniceus*	Canal
Brewer's blackbird	*Euphagus cyanocephalus*	Canal
Western Meadowlark	*Sturnella neglecta*	Canal and SEC plant site
House finch	*Carpodacus mexicanus*	Canal and SEC plant site
House sparrow (Exotic)	*Passer domesticus*	Canal and SEC plant site
MAMMALS		
California vole	*Microtus californicus*	Numerous tunnels observed on site and in farm access roads
Botta's pocket gopher	*Thomomys bottae*	Numerous tunnels observed on site and in farm access road. Skelton observed along farm road.
California ground squirrel	*Spermophilus beecheyi*	Burrows observed along canals and farm access roads.
Coyote	*Canis latrans*	Scat observed along entire alignment
Raccoon	*Procyon lotor*	Scat and tracks observed along canal and rice field banks
River otter	*Lontra canadensis*	Scat and bank slides observed along canals

3.2.1.3 Special-status Species

No special-status species were observed during the January 15, 2013, survey of the new generator tie-line route and substation site; however, several special-status species are assumed to occur within the proposed impact area, as follows:

- The federal and state threatened giant garter snake (*Thamnophis gigas*) is known to occur in irrigation canals and rice fields in Sutter County. This species is assumed to be present in the large irrigation canals and rice fields. Many burrows were observed in the banks of the irrigation canals, and these could provide suitable hibernacula for giant garter snakes.
- The federal Species of Concern American bittern (*Botaurus lentiginosus*) is known to nest along the rice fields in the project area. The vegetation in the drainage ditches, canals, and rice fields along the generator tie-line route provide suitable habitat for nesting.
- The California threatened Swainson's hawk (*Buteo swainsoni*) could forage in the rice fields that surround the generator tie-line route. Several large willows were observed near the route that could support nesting opportunities for Swainson's hawk. The nesting season for Swainson's hawk in California is from late February though August. No Swainson's hawks were observed during the survey on January 15.
- The California Species of Special Concern western pond turtle (*Emys marmorata)* is known to inhabit large irrigation canals and drainage ditches such as those found along the generator tie-line route.

The AFC included a list of special-status plant and wildlife species compiled for the project area based upon the following references: (1) the CDFW California Natural Diversity Data Base (CNDDB), (2) a USFWS species list for the area, (3) the California Native Plant Society (CNPS) database, (4) the National Marine Fisheries Service website, (5) informal consultations with USFWS agency personnel, and (6) project-specific field surveys. The USFWS, CNDDB, CNPS, and National Marine Fisheries Service lists have been updated for this Petition (USFWS, 2013; CDFW, 2013; NMFS, 2013; CNPS, 2013). Figure 3.2-1 is a map showing the occurrences of species listed in the CNDDB.

Special-status Plants

The analysis conducted for the AFC in 1997 indicated that, at that time, 12 special-status plant species and five rare communities had the potential to occur in the project area. A new CNDDB search conducted for this Petition resulted in no additions to the 1997 list; however, nine of the species and three of the rare communities on the 1997 list are not present on the 2013 list.

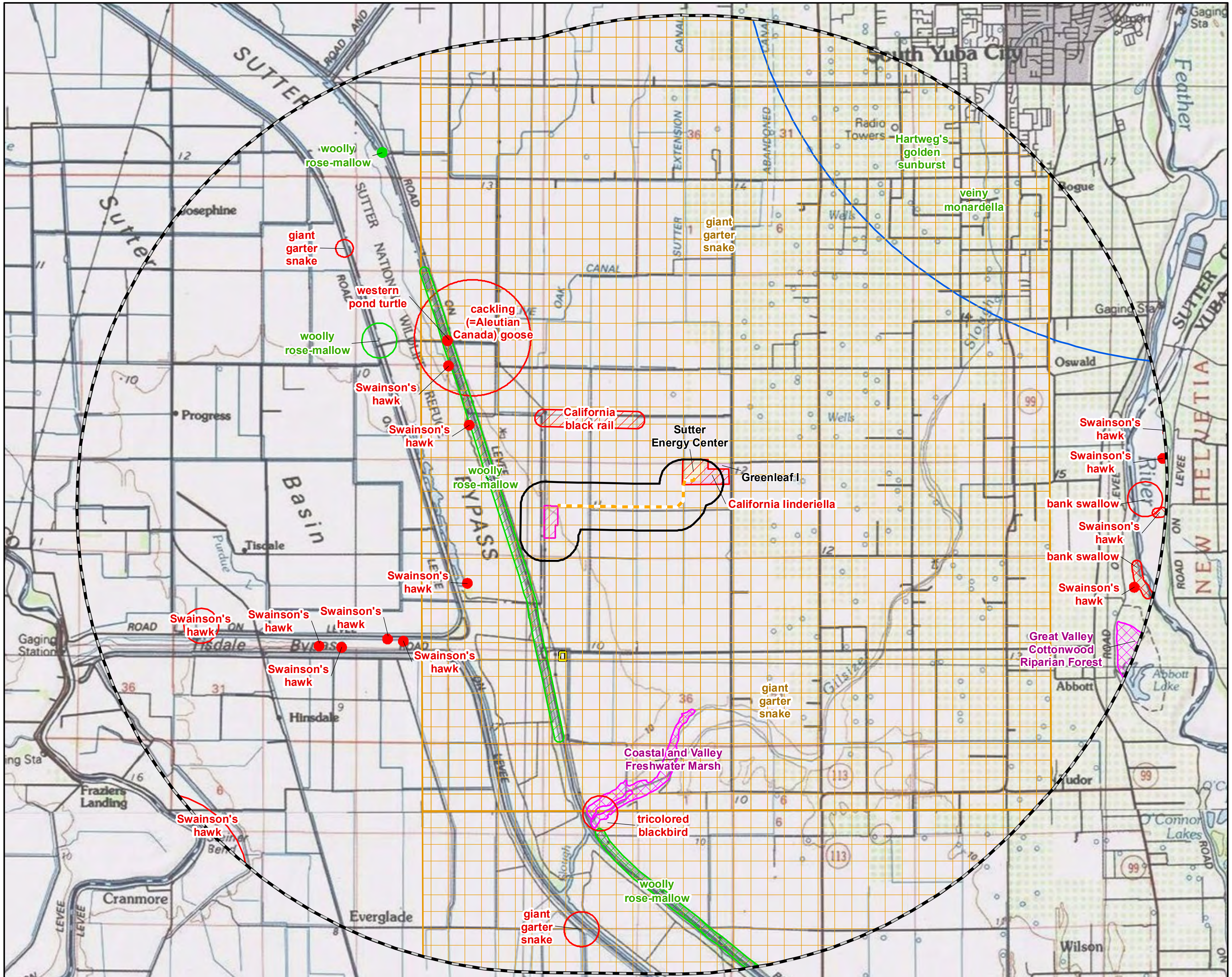
TABLE 3.2-2
Special-status Plants and Rare Communities that Occur or Potentially Occur in the Project Area

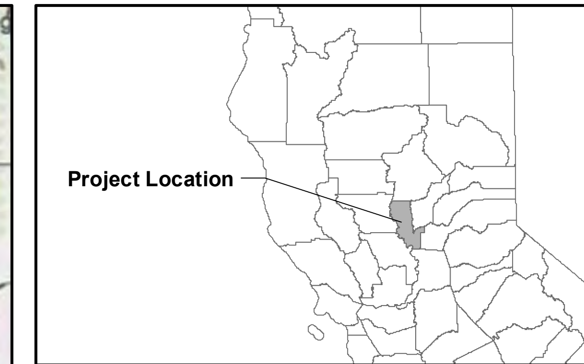
Common Name	Scientific Name	Status Fed/State	Potential Habitat in Project Areas	Potential for Impacts in Project Areas	1997 List (AFC)	2013 List (Petition)
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	FE/SE, 1B	AG	no	x	x
Veiny monardella	*Monardella venosa*	1B	AG	no	x	x
Woolly rose-mallow	*Hibiscus lasiocarpos var. occidentalis*	1B	freshwater marsh, SNWR	yes	x	x
Ferris's milk-vetch	*Astraglus tener* var. *ferrisiae*	SC, 1B	meadows, AG	no	x	—
Palmate-bracted bird's beak	*Caordylanthus palmatus*	FE/SE, 1B	AG	no	x	—
Heartscale	*Atriplex cordulata*	SC, 1B	AG, VP	no	x	—
Little mousetail	*Myosurus minimus* ssp. *apus*	SC, 3	VP	no	x	—
Wright's trichocoronis	*Trichocoronis wrightii* var. *wrightii*	2	marsh, RI, VP	no	x	—
Hairy Orcutt grass	*Orcuttia pilosa*	CE/PE, 1B	VP	no	x	—
Adobe lily	*Fritillaria pluriflora*	SC, 1B	AG	no	x	—
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	CE, 1B	VP	no	x	—
Legenere	*Legenere limosa*	SC, 1B	VP	no	x	—
Great Valley cottonwood riparian	—	none	none	no	x	x
Great Valley mixed riparian forest	—	none	none	no	x	—
Northern hardpan vernal pool	—	none	none	no	x	—
Valley freshwater marsh	—	none	Gilsizer Slough	no	x	x
Great Valley willow scrub	—	none	none	no	x	—

Note: Shading indicates species no longer listed

Federal, state and CNPS status codes:
- FE: Federally Endangered
- FT: Federally Threatened
- FSC: Federal Species of Concern
- SE: State Endangered
- ST: State Threatened
- CSC: State Species of Special Concern
- FP: State Fully-protected Species
- 1B: CNPS rare or endangered in California and elsewhere
- 2: CNPS rare or endangered in California, more common elsewhere

Habitat area codes:
- SNWR: Sutter National Wildlife Refuge
- SB: Sutter Bypass
- AG: Annual grassland
- RI: Riparian
- VP: Vernal pool





LEGEND

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation
- Proposed Underground Generator Tie-Line
- Quater Mile Buffer
- Five Mile Buffer

CNDDB (January 2013)

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (specific)
- Multiple (circular)
- Giant garter snake (Sensitive EO)

Note:
1. Source - California Dept. of Fish and Game, California Natural Diversity Database (CNDDB) January, 2013.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

FIGURE 3.2-1
CNDDB-listed Occurrences of Special-Status Species
Sutter Energy Center

Special-status Wildlife

The analysis conducted for the AFC in 1997 indicated that, at that time, 45 special-status wildlife species had the potential to occur in the general project area. A new CNDDB and USFWS species list search conducted for this Petition resulted in three additions to this list. Also, 29 of the species on the 1997 list are not present on the 2013 list (see Table 3.2-3).[2] The results of the search are included as Appendix 3.2A.

TABLE 3.2-3
Special-status Wildlife Species that Occur or Potentially Occur in the Project Area

Common Name	Scientific Name	Status Fed/State	Potential Habitat in Project Areas	Potential for impacts in Project Areas	1997 List (AFC)	2013 List (Petition)
Fringed myotis	*Myotis thysanodes*	NA/NA	none	no	x	—
Greater western mastiff bat	*Eumops perotis californicus*	NA/SSC	none	no	x	—
Long-eared myotis	*Myotis evotis*	NA/NA	none	no	x	—
Long-legged myotis	*Myotis volans*	NA/NA	none	no	x	—
Pacific western (Townsend's) big-eared bat	*Plecotus townsendii townsendii*	NA/SSC	none	no	x	—
Ring-tailed cat	*Bassariscus astutus*	NA/NA	SNWR, RI	no	x	—
San Joaquin pocket mouse	*Perognathus inornatus*	NA/NA	none	no	x	—
Small-footed myotis	*Myotis ciliolabrum*	NA/NA	none	no	x	—
Yuma myotis	*Myotis yumanensis*	NA/NA	SNWR, RI	no	x	—
Marysville kangaroo rat	*Dipodomys californicus eximius*	NA/SSC	none	no	x	—
Aleutian Canada goose	*Branta canadensisleucopareia*	DL/NA	SNWR, RI	yes	x	x
American peregrine falcon	*Falco peregrinus anatum*	DL/DL, SP	winter forage, SNWR, AG	yes	x	—
Bald eagle	*Haliaeetus leucocephalus*	DL/SE, FP	winter forage, SNWR, AG	yes	x	—
Bank swallow	*Riparia riparia*	NA/ST	none	no	x	x
Burrowing owl	*Athene cunicularia*	NA/SSC	AG	no	x	
California black rail	*Laterallus jamaicensis coturniculus*	NA/ST, FP	SNWR	no	—	x
Ferruginous hawk	*Buteo regalis*	NA/WL	AG	no	x	—
Little willow flycatcher	*Empidonax trailii brewsteri*	NA/SE	SNWR	no	x	—
Mountain plover	*Chradrius montanus*	PT/SSC	winter forage, SNWR, AG	no	x	—
Swainson's hawk	*Buteo swainsoni*	NA/ST	SNWR, RI, AG	yes	x	x
Tricolored blackbird	*Agelaius tricolor*	NA/SSC	SNWR, RI	no	x	x

[2] The Sacramento Office of the U.S. Fish and Wildlife Service no longer maintains a list of Federal Species of Concern, which accounts for many of the species that were present on the 1997 list of species that potentially occur in the project area.

TABLE 3.2-3
Special-status Wildlife Species that Occur or Potentially Occur in the Project Area

Common Name	Scientific Name	Status Fed/State	Potential Habitat in Project Areas	Potential for impacts in Project Areas	1997 List (AFC)	2013 List (Petition)
Western yellow-billed cuckoo	*coccyzuys americanus occidentalis*	FC/SE	SNWR, RI	no	x	x
White-faced ibis	*Plegadis chihi*	NA/WL	SNWR, flooded crop	yes	x	—
White-tailed kite	*Elanus leucurus*	NA/FP	SNWR, RI, AG	yes	x	—
Greater sandhill crane	*Grus canadensis tabida*	NA/ST, FP	SNWR, RI, AG	yes	x	—
California red-legged frog	*Rana draytonii*	FT/SSC	SNWR	no	x	x
California tiger salamander	*Ambystoma californiense*	FT/ST, SSC	AG	no	x	x
Foothill yellow-legged frog	*Rana boylii*	NA/SSC	none	no	x	—
Western spadefoot	*Spea hammondii*	NA/SSC	SNWR	no	x	—
Giant garter snake	*Thamnophis gigas*	FT/ST, SSC	AW, sloughs	presence assumed	x	x
Western pond turtle	*Emys marmorata*	SSC	SNWR	yes	x	x
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	NA/SSC	AG	no	x	—
Central Vall winter-run chinook salmon, Sacramento River	*Oncorhynchus tshawytscha*	FE/SE	migration, SNWR	presence assumed	x	x
Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	FT, CH/ST	migration, SNWR	presence assumed	—	x
Central Valley steelhead	*Oncorhynchus mykiss*	FT, CH	migration, SNWR	presence assumed	x	x
River lamprey	*Lampetra ayresi*	NA/SSC	none	no	x	—
Pacific lamprey	*Lampetra tridentata*	NA/NA	none	no	x	—
Longfin smelt	*Sprinchus thaleichthys*	NA/SE, SSC	none	no	x	—
Sacramento splittail	*Pogonichthys macrolepidotus*	NA/SSC	SB	presence assumed	x	—
Delta smelt	*Hypomesus transpacificus*	FT/SE	none	no	x	x
Green sturgeon	*Acipenser medirostris*	FT/SSC	none	no	x	x
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT/NA	none	no	x	x
Conservancy fairy shrimp	*Branchinecta conservatio*	FE/NA	none	no	—	x
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT/NA	SW	no	x	x
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE/NA	SW	no	x	x
Antioch Dunes anthicid beetle	*Anthicus antiohensis*	NA/NA	none	no	x	—
Sacramento anthicid beetle	*Anthiscus sacramento*	NA/NA	none	no	x	—

TABLE 3.2-3
Special-status Wildlife Species that Occur or Potentially Occur in the Project Area

Common Name	Scientific Name	Status Fed/State	Potential Habitat in Project Areas	Potential for impacts in Project Areas	1997 List (AFC)	2013 List (Petition)
Sacramento Valley tiger beetle	*Cicindelta hirticollis abrupta*	NA/NA	none	no	x	—

Note: Shading indicates species no longer listed

Federal, state and CNPS status codes:
FE: Federally Endangered
FT: Federally Threatened
FSC: Federal Species of Concern
SE: State Endangered
ST: State Threatened
CSC: State Species of Special Concern
FP: State Fully-protected Species
DL: Delisted
NA: Not applicable (not listed)

Habitat area codes:
SNWR: Sutter National Wildlife Refuge
SB: Sutter Buttes
AG: Annual grassland
RI: Riparian
VP: Vernal pool

3.2.1.4 Wetlands

Onsite Facilities

The auxiliary boiler will be constructed adjacent to one of the SEC HRSGs and entirely within the currently developed (paved and graveled) area of the SEC power block. Construction of the ACC expansion will involve the extension of the power block area to the west outside of the currently developed area. Wetland delineations conducted as part of the biological resources investigations for licensing the plant in 1997 found 8.67 acres of seasonal wetlands on the SEC property, of which 2.84 acres could be avoided and 5.83 would be filled as part of construction. The 1999 Biological Opinion (USFWS, 1999) on SEC construction and operation acknowledged the mitigation of the 5.83 acres of filled wetlands at a 1:1 ratio, and the project owner purchased wetland credits to fulfill the regulatory requirement for mitigation. CEC Condition of Certification BIO-11 required monitoring after construction to confirm that the seasonal wetlands that were avoided by construction would not be disturbed during project operation.

The extension of the power block to accommodate the ACC expansion would extend the existing perimeter road and SEC fence line to the west for approximately 80 feet to accommodate the two new rows of condenser fans. The new construction will take place near the location of one of the seasonal wetlands filled and mitigated as part of the original construction. After construction of SEC, the entire area outside of the perimeter road and fence line was re-graded.

Field surveys to investigate and delineate possible wetlands were conducted on January 18 and February 21, 2013, by CH2M HILL biologist Rick Crowe and soils/wetland scientist Steven Long. This survey resulted in mapping of some water and drainage features for further investigation. These features are shown in Figure 3.2-2 and are of the following types:

- **Seasonal wetland areas**—These areas drain or connect to the canals along the western and southern property boundaries and are likely to qualify as waters of the United States. They show evidence of all three wetland parameters (wetland vegetation, hydric soils, and hydrological connectivity). Suitable hydrology for listed crustaceans may exist only in one of these: SW-003. Features SW-001 and SW-002 did not indicate sufficient water for crustaceans at the time of the survey. Project construction would avoid direct impacts to these features.
- **Seasonal ponding areas**—These areas consist of previously disturbed and compacted construction fills and are not jurisdictional wetlands, as they lack wetland vegetation and hydric soils. At the time of survey, they did not have adequate water depth to qualify as habitat for listed vernal pool crustaceans and no crustaceans were observed in them.

- **Overland flow areas**—These areas show evidence of surface water flow as runoff from the ACC pad or from the retention pond outfall. The pad runoff areas are generally devoid of vegetation (possibly due to scour and or poor soil fertility and physical conditions in the construction fill). The retention pond outfall has dominant upland vegetation (mostly yellow star thistle). These are not jurisdictional wetland areas as they lack wetland plants, hydrology, and hydric soils and they do not appear to be suitable habitat for listed crustaceans. They contained no standing water at the time of survey.

The 2.84 acres of seasonal wetlands that were avoided during construction of SEC would also be avoided during construction of the ACC expansion. One of these wetlands (SPP-01) is located in the southwest corner of the SEC property, but lies outside of the SEC fence line, outside the area that the new fence line will encompass, and across a drainage ditch from the SEC ACC. The underground generator tie-line will run adjacent to this wetland but will not directly affect it, as long as proper protection and avoidance measures are observed.

All of the other wetlands that were avoided during SEC construction are located on the opposite side of the SEC from the ACC and outside of the SEC fence line and would not be affected by auxiliary boiler or ACC expansion construction. Most of these are in the southeast corner of the SEC property, just southeast of the adjacent cogeneration power plant. However, the boundaries of this wetland will be flagged and will be monitored during construction to ensure that it is not disturbed.

Generator Tie-line and Substation

A wetland delineation of the generator tie-line and substation areas (ICF, 2012) identified the following types of wetlands and waters within the area of potential effects for these features.

- Wetland Drainage (WD)
- Rice Field Wetland (RFW)
- Other Waters Drainage (OWD)

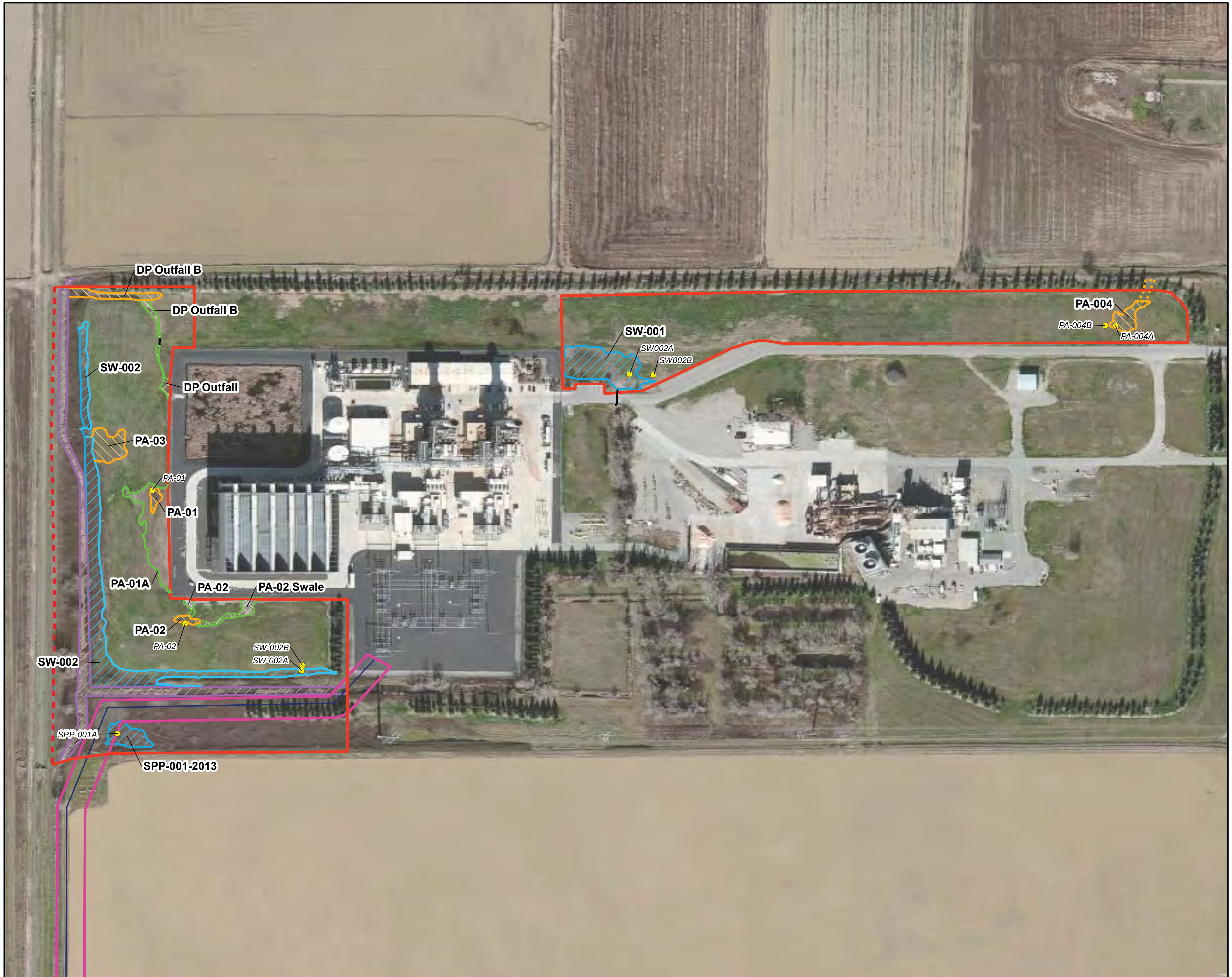
A preliminary delineation of wetlands and other water bodies along the generator tie-line portion of the project was conducted on November 2, 2010 (ICF, 2012), separately from the onsite delineation studies of 2013. The delineation was conducted to assist CCFC in determining the type and extent of wetlands and other water bodies in the delineation area that may be waters of the United States and subject to regulation by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. The delineation area included areas along the generator tie-line route that could be directly or indirectly disturbed during construction and maintenance of the project and extended 500 feet from both sides of each of two generator tie-line alignments (one of which was later dropped from consideration). Also included in the delineation area was a 160-acre parcel within which the new 28-acre switching yard would be constructed.

The generator tie-line route runs through rice fields and is mostly sited in agricultural field roads that separate rice fields. Therefore, all of the adjacent area to the generator tie-line consists of Rice Field Wetland, and the new substation is sited entirely in existing rice fields (25 to 35 acres). The rice fields are bounded in places by irrigation supply canals (WD) and drainages (OWD). Figures 3.2-3a-c show these wetlands and waters. The generator tie-line wetland delineation report is provided in Appendix 3.2B.

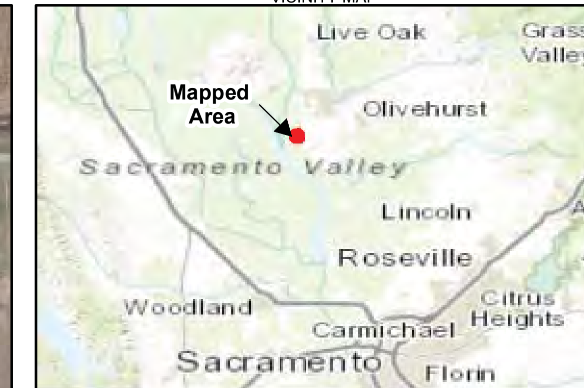
No new habitats, special-status species, or rare plant communities were identified during the January 2013 site survey that were not previously identified in the AFC.

3.2.2 Environmental Consequences

The AFC evaluated potential direct and indirect impacts to biological resources to determine the permanent and temporary effects of construction, operation, maintenance, and decommissioning of the SEC project and supporting facilities. This section includes an evaluation of the impacts associated with the new generator tie-line and auxiliary boiler and ACC expansion.



VICINITY MAP



LEGEND

- Wetland Data Point
- Limit of Investigation (Dashed Where Approximate)
- Culvert
- Drainage Channel
- Seasonal Ponding
- Seasonal Wetland
- Overland Flow/ Upland Swale Area
- Construction Area
- ROW

Notes:

1. Assessment of wetlands and potential habitat for listed seasonal crustaceans within potential ACC annex areas and construction laydown areas was conducted on January 18 and February 21, 2013 by CH2MHILL wetland scientist, Steve Long and biologist Rick Crowe.

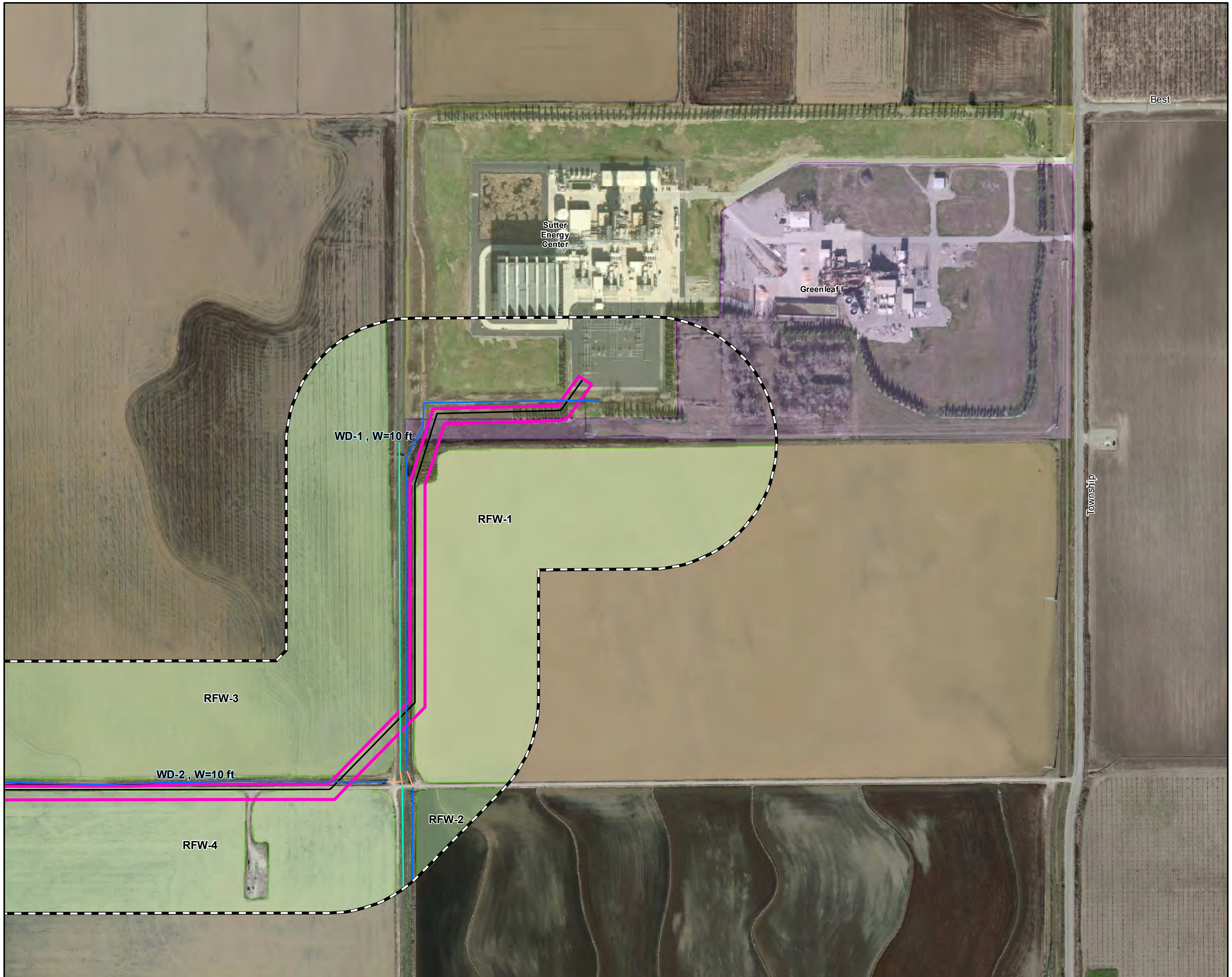
2. Areas of investigation had been recently mowed. Vegetation control in these areas (along windbreaks) is also managed by herbicide applications that were observed during the January 18, 2013 site visit.

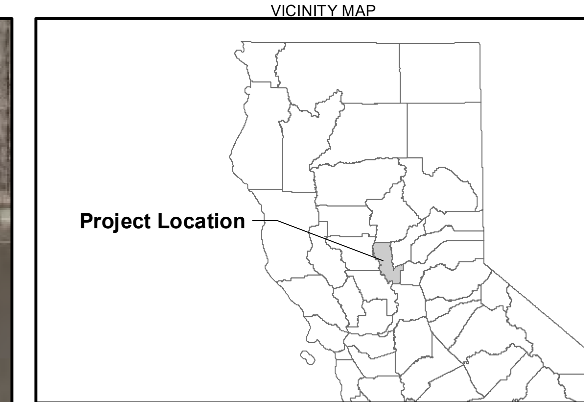
N

0 150 300
Feet

FIGURE 3.2-2
Wetland Features in the ACC Expansion Work Area
Sutter Energy Center

CH2MHILL.





LEGEND

- Wetland Delineation Study Area
- Construction Area
- ROW

Project Features

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation

- Culvert

Other Waters

- Other Waters Drainage (OWD)
- Wetland Drainage (WD)

Wetlands

- Rice Field Wetland (RFW)
- Freshwater Emergent Wetland
- Riverine

W = Width

Source: NWI (2012), ICF, Appendix A (2012).

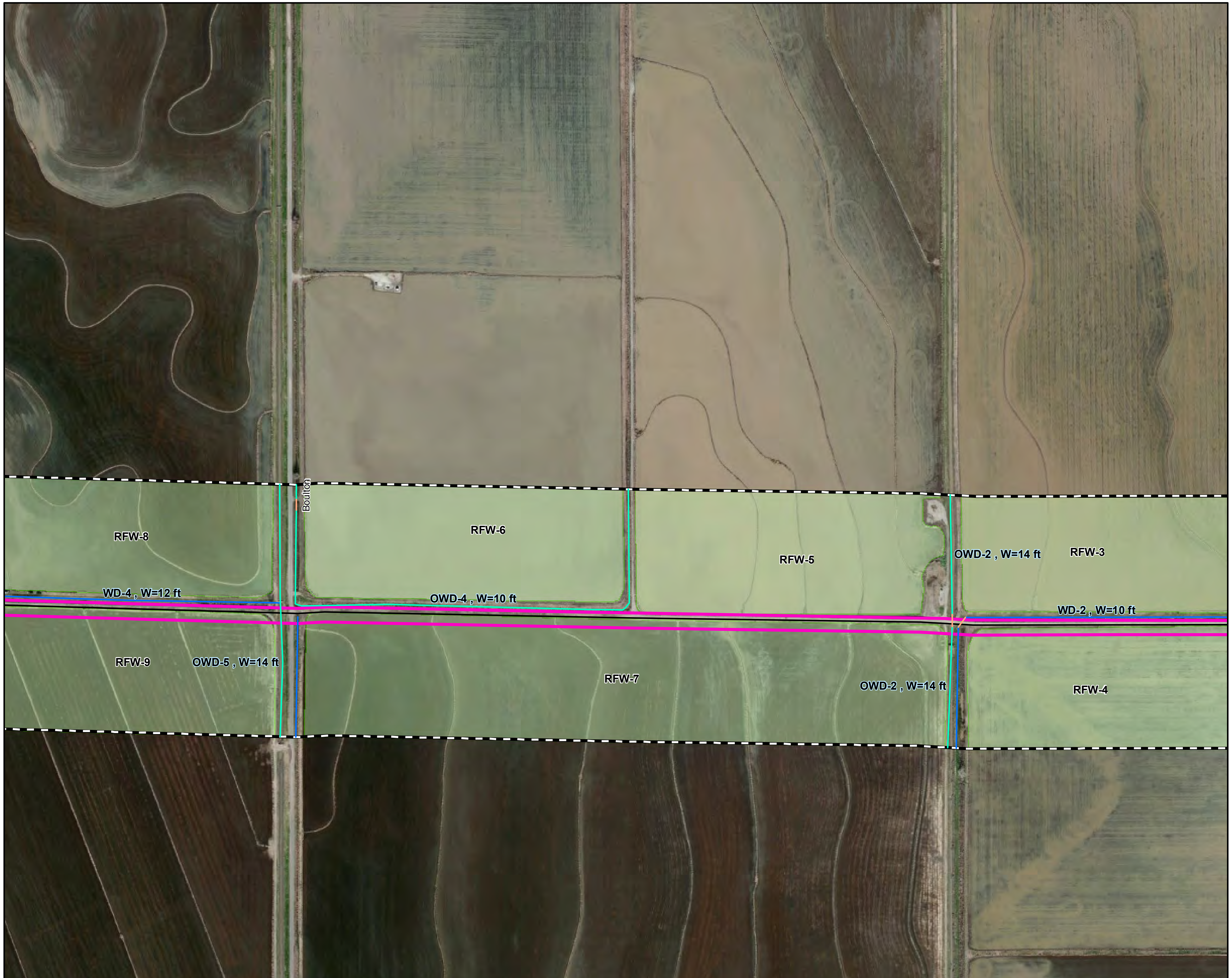
N

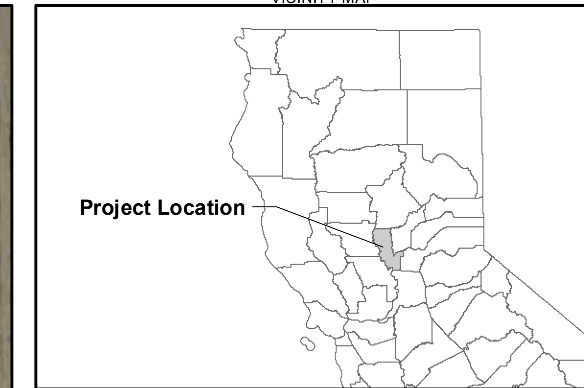
0 400 800
Feet

FIGURE 3.2-3a
Wetland Delineation of the Generator Tie-Line and Substation Site
Sutter Energy Center

UNK P:\SUTTER_ENERGY_CENTER\MAPFILES\WETLAND\SEC_WETLAND.MXD GPERDEW 2/19/2013 12:47:10 PM

CH2MHILL.





LEGEND

- Wetland Delineation Study Area
- Construction Area
- ROW

Project Features

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation

- Culvert

Other Waters

- Other Waters Drainage (OWD)
- Wetland Drainage (WD)

Wetlands

- Rice Field Wetland (RFW)
- Freshwater Emergent Wetland
- Riverine

W = Width

Source: NWI (2012), ICF, Appendix A (2012).

N

0 400 800
Feet

FIGURE 3.2-3b
Wetland Delineation of the Generator Tie-Line and Substation Site
Sutter Energy Center

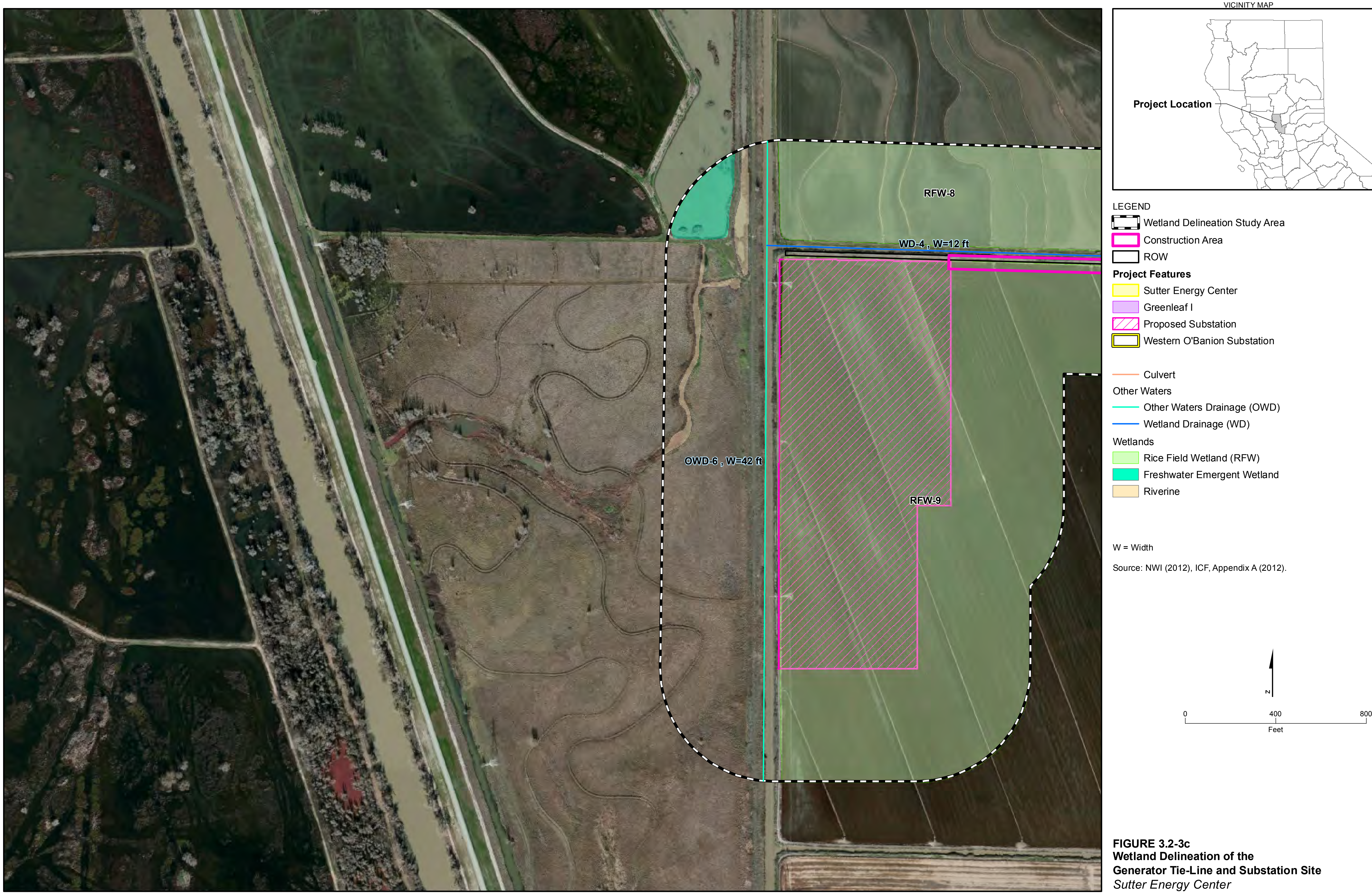


FIGURE 3.2-3c
Wetland Delineation of the Generator Tie-Line and Substation Site
Sutter Energy Center

UNK P:\SUTTER_ENERGY_CENTER\MAPFILES\WETLAND\SEC_WETLAND.MXD GPERDEW 2/19/2013 12:47:10 PM

CH2MHILL

3.2.2.1 Potential Effects of Construction on Wetlands and Waters of the United States

Construction of the ACC would involve the rerouting of the perimeter road and SEC boundary fence line approximately 80 feet to the west. Although this area shows some evidence of seasonal ponding it is not a jurisdictional wetland, does not provide suitable habitat for listed vernal pool crustaceans, and lies within the area of disturbance for the original construction of the SEC, within which all wetland impacts were mitigated. Direct impacts to wetland features SW-001 and SW-002 can be avoided. SW-001 is located at the west end of the prospective laydown area north of the SEC entrance road. Further examination on February 21, 2013, showed that SW-001 will be flagged and avoided if this area is needed for laydown. SW-002 runs south and west of the ACC expansion area and SEC switchyard, and generator tie-line construction would avoid this feature.

As stated previously, construction of the underground generator tie-line would cause temporary impacts to wetlands during construction. These impacts would exceed those reported in the AFC. Specifically, approximately 1.23 acres of wetland drainages and 35.8 acres of rice field wetlands would be temporarily disturbed during construction. In addition, construction of the generator tie-line would take place within a few feet of seasonal pond SPP-001, which is located outside of the power plant fence line, but within the parcel boundary. The Conditions of Certification, as amended, contain mitigation measures and best management practices (BMP) that will help avoid impacting this wetland during construction.

Construction of the new 500 kV substation would permanently remove 25 to 35 acres of rice field wetlands. CCFC would be required to obtain a permit from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act to construct the underground generator tie-line trench adjacent to or through the jurisdictional seasonal pond (SPP-001), wetland drainages, and rice field wetlands, and to fill the rice field wetlands located at the substation site. The Section 404 permit would also require Water Quality Certification under Section 401 of the Clean Water Act. The USACE will consult with the USFWS regarding the potential for the project to adversely affect species listed under the federal Endangered Species Act (see next subsection). The CEC staff will consult with the CDFW regarding state-listed species and with the Sutter Extension WD regarding permit requirements that would be imposed if encroachment permit for the canal crossings were issued.

3.2.2.2 Potential Effects of Construction on Special-status Species

Construction of the SEC generator tie-line could result in additional impacts to special-status species beyond those identified in the AFC; specifically, potential additional impacts to Swainson's hawks, giant garter snake, and migratory and nesting bird species. Construction near nesting Swainson's hawks and migratory birds could disrupt breeding and would temporarily remove foraging area. The Swainson's hawk is a state-listed species and the construction of the substation could result in a loss of foraging habitat for this species. However, within the SEC boundaries, no impacts are anticipated to special-status species.

Similarly, construction has the potential to result in take of the threatened giant garter snake because it will disrupt foraging and nesting habitat and will remove some rice field habitat for substation use. These potential impacts will be described in detail in a Biological Assessment for submittal to USACE as a document to accompany CCFC's application for a permit under Section 404 of the Clean Water Act to dredge and fill waters of the United States. As stated previously, the project will require this permit to cross jurisdictional wetlands along the generator tie-line route and to fill or berm the substation site. Under Section 7 of the federal Endangered Species Act, USACE will be required to consult with USFWS to resolve any potential adverse effects to species listed under the ESA, and USFWS may recommend mitigation measures.

As described in the AFC, noise and activity from construction activities could temporarily prevent wildlife from foraging on the site and nesting adjacent to the site. Noise from construction of the auxiliary boiler and ACC, however, would be relatively low level and of short duration. Therefore, no new noise impacts to biological resources are expected during construction that have not already been taken into consideration in the Commission's Decision.

3.2.2.3 Potential Effects from Operation

When SEC was first constructed, one of the biological resources issues of concern had to do with the potential for listed birds to be harmed by collision with the generator tie-line, HRSG stacks, or ACC. The species of concern at the time of licensing were the federally listed bald eagle, peregrine falcon, greater sandhill crane, Aleutian Canada goose, and state-listed Swainson’s hawk. The Biological Opinion for SEC set specific take allowances for the federally listed species and the CEC Decision required monitoring of the power block and generator tie-line to assess the continuing potential for take of listed species by collision.

The 5-year-long monitoring program (Calpine Corporation, 2005) required under Condition BIO-10 documented the extent of bird injury due to collisions with the generator tie-line, HRSG stacks, and ACC. Bird collisions with the generator tie-line averaged about 8.4 per year over the 5-year period and none of these involved listed species or waterfowl other than a single incident involving an American coot. Generally speaking, bird carcasses recovered resulted from vehicle strikes on South Township and O’Banion roads and from collisions with lower voltage transmission lines, which are smaller and more difficult for birds to see. On this basis, it is not likely that the expanded ACC or new substation would result in significant impacts to listed species of birds due to collisions.

Noise from operation of the new substation could cause minor disturbance of wildlife using nearby areas, including Swainson's hawks and migratory bird species. However, wildlife may become accustomed to the operational noise. Moreover, additional noise resulting from the addition of the auxiliary boiler and ACC expansion is not expected to significantly exceed levels identified in the AFC (see Section 3.7). Therefore, no new noise impacts to biological resources are expected during operation.

3.2.3 Mitigation Measures

Mitigation measures currently in place in the form of the Commission Decision Conditions of Certification as amended by the Grimes Pipeline amendment are sufficient to reduce most of the potential effects of the equipment and interconnection upgrades to levels below significance. Additional measures beyond those of the Commission Decision as previously amended may be necessary, however, to mitigate the potential effects of the new generator tie-line and substation construction on wetlands and listed species such as giant garter snake and Swainson’s hawk, because the specific locations of these modifications were not considered in the Decision or previous amendments. These additional measures will be determined in detail through consultation with CEC Staff and federal agencies including the USACE and USFWS.

3.2.4 Consistency with LORS

The construction and operation of the SEC, as amended, will conform with all applicable LORS related to biological resources. In addition to the LORS cited in the AFC, the following additional LORS are included in the Petition.

3.2.4.1 Federal LORS

Bald and Golden Eagle Protection Act (16 United States Code 668) specifically protects bald and golden eagles from harm or trade in parts of these species.

3.2.4.2 State LORS

Fish and Game Code Section 3503 states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.

Fish and Game Code Section 3503.5 protects all birds of prey and their eggs and nests.

Fish and Game Code Section 3513 makes it unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird.

California Fish and Game Code (Sections 1601 through 1607) prohibits alteration of any stream, including intermittent and seasonal channels and many artificial channels, without a permit from CDFW. CDFW jurisdiction is limited to areas within the 100-year floodplain. Within this zone, CDFW jurisdiction is subject to the judgment of the department. This applies to any channel modifications that would be required to meet drainage, transportation, or flood control objectives of a project.

California Environmental Quality Act (Public Resources Code Section 15380) defines "rare" in a broader sense than the definitions of threatened, endangered, or species of special concern. Under this definition, CDFW can request additional consideration of species not otherwise protected. CEQA requires that the effects of a project on environmental resources must be analyzed and assessed using criteria determined by the lead agency.

3.2.4.3 Local and Other Jurisdictions' LORS

Applicable Habitat Conservation Plans and Critical Habitat Designations

The project is in the area that will be covered by the Yuba-Sutter Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP); however, this plan is still in development and has not been approved. The primary objective the plan is to conserve natural communities at the ecosystem level while accommodating compatible land use and economic activities. As a part of the NCCP/HCP implementation process, habitat reserves will be established for giant garter snake, Swainson's hawk, and other covered species. The plan would cover construction, operation, and maintenance of a broad array of facilities from residential to transportation to public utilities and water supply facilities.

3.2.5 References Cited

Avian Power Line Interaction Committee. 2012. *Reducing Avian Collisions with Power Lines, the State of the Art in 2012*. Prepared for Edison Electric Institute

California Department of Fish and Wildlife (CDFW). 2013. *State and federal special-status species occurrences within 5-miles of the Sutter Energy Center*. California Natural Diversity Database. January.

California Energy Commission (CEC). 1999. Energy Commission Decision, Application for Certification for the Sutter Power Plant Project, Docket Number 97-AFC-2. California Energy Commission, Sacramento, California. April.

California Native Plant Society (CNPS). 2013. Inventory of Rare and Endangered Plants (online edition, v8-01a). California Native Plant Society. Sacramento, CA. Accessed on Wednesday, January 16, 2013. Online at: http://www.rareplants.cnps.org/advanced.html

Calpine Corporation. 2005. Sutter Energy Center Avian Collision Monitoring Report, 2005, Fifth Year Monitoring Report, California Energy Commission BIO-10. Submitted by Calpine Corporation, Yuba City, California. Prepared by CH2M HILL, Sacramento, CA. December, 2005.

ICF International (ICF). 2012. *Preliminary Delineation of Wetlands and Other Water Bodies for the Sutter Linears Enhancement Project, Sutter County, California*. Prepared for Calpine Construction Finance Company, L.P. October.

National Marine Fisheries Service (NMFS). 2013. ESA Salmon Listings. Protected Resources Division, Northwest Regional Office. January 16. Online at: http://www.nwr.noaa.gov/ESA-Salmon-Listings/

U.S. Fish and Wildlife Service (USFWS). 2013. List of Federally Protected Species for the following quads: Gilsizer Slough, Tisdale Weir, Sutter Buttes, Sutter, Yuba City, Olivehurst, Nicolaus, Sutter Causeway, and Kirkville. January 16. Online at: http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-overview.htm

USFWS. 1999. Formal Section 7 Consultation on the Calpine Corporation Sutter Power Plant Project, Sutter County, California (Biological Opinion). Cay C. Goude, Acting Supervisor, U.S. Fish and Wildlife Service to Loreen McMahon, Western Area Power Administration. April 2, 1999.

3.2.6 Conditions of Certification

SEC requests the following minor modification to the Conditions of Certification for biological resources. SEC requests that Condition BIO-4 be changed from the condition adopted for the Grimes Pipeline to make the condition applicable to this license amendment and to allow the Worker Environmental Awareness Program to be presented in the form of a video presentation. Given that some of the construction activities would not require the Designated Biologist or monitors to be present on the project site each day, this modification would allow new worker training to take place when the Designated Biologist is not on site. This change is consistent with the current practice on many projects and is especially applicable for this amendment.

Condition BIO-4 is presented below as modified in the Commission Decision approving the Grimes Pipeline amendment and with. The changes requested for this amendment shown in bold and underlined.

BIO-4 Worker Environmental Awareness Program The project owner shall develop and implement a Worker Environmental Awareness Program (WEAP) in which each of its own employees, monitors, inspectors, contractors and subcontractors who work on the project site **<u>or related facilities (including any access roads, storage areas, transmission lines, water and gas lines)</u>** during construction and operation, shall be required to take the WEAP training to become informed about biological resource sensitivities associated with the project.

The Worker Environmental Awareness Program:

1) shall be developed by the Designated Biologist and consist of an on-site or classroom **<u>or video</u>** presentation in which supporting written material is made available to all participants;
2) must discuss the locations and types of sensitive biological resources on the project site and adjacent areas specifically training workers to recognize giant garter snakes, their habitat(s), nature and purpose of protection measures, the need to report all sightings of giant garter snakes, consequences of not complying with permit conditions and measures, and the terms and conditions of any permit applicable to the project. The Designated Biologist must identify giant garter snake habitat areas and indicate to all site personnel that they are Environmentally Sensitive Areas in the WEAP training;
3) must present the reasons for protecting these resources;
4) must present the meaning of various temporary and permanent habitat protection measures; and
5) must identify who to contact if there are further comments and questions about the material discussed in the program.

The specific program shall be administered by the Designated Biologist.

Each participant in the on-site Worker Environmental Awareness Program shall sign a statement declaring that the individual understands and shall abide by the guidelines set forth in the program material. Each statement shall also be signed by the person administering the Worker Environmental Awareness Program. The signed statements for the construction phase shall be kept on file by the project owner and made available for examination by the CPM for a period of at least six (6) months after the start of commercial operation. Signed statements for active operational personnel shall be kept on file by the project owner for the duration of their employment and for six months after their termination.

Verification: At least 30 days prior to the start of any ground-disturbing activities, the project owner shall provide copies of the draft Worker Environmental Awareness Program and all supporting written materials prepared by the Designated Biologist to the CPM for review and comment. Within 10 days prior to the start of any ground-disturbing activities, a final approved WEAP with agency comments addressed shall be submitted to the CPM.

The project owner shall state in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date.

3.3 Cultural Resources

Construction of the auxiliary boiler and ACC will result in only minor ground disturbance with little potential to encounter buried archaeological sites and these impacts were considered in the AFC and Commission Decision. The construction of a new generator tie-line and substation will involve new ground disturbance that could affect cultural resources differently than described in the Commission Decision. For this reason, the Project Owner conducted additional field inventory to determine if significant cultural resources are present in areas not previously surveyed.

3.3.1 Environmental Baseline Information

CH2M HILL requested a literature search for the SEC facility site and the new generator tie-line and substation areas from the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The search radius was 0.5 mile around the proposed generator tie-line corridor and SEC site. The CHRIS literature and records review included a review of all recorded archaeological sites as well as all known cultural resource survey and excavation reports. The National Register of Historic Places (NHRP), the California Register, California Historical Landmarks, and California Points of Historical Interest, as well as historical maps, including the 1895 and 1901 *Marysville, California* 15' U.S. Geological Survey (USGS) topographic quadrangle maps and the 1952 *Gilsizer Slough, California 7.5*' USGS topographic quadrangle map were examined. State and local listings were consulted for the presence of historic buildings, structures, landmarks, points of historical interest, and other cultural resources. The results of the record search are included in Appendix 3.3A, which has been submitted separately to the CEC under a request for confidentiality.

According to information available in the CHRIS files, four previous cultural resource studies have been prepared within the proposed generator tie-line corridor. Two additional studies have been prepared within 0.5 mile of the corridor. These studies are limited to archaeological assessment reports. Table 3.3-1 shows all cultural resource studies conducted within 0.5 mile of the proposed corridor.

TABLE 3.3-1
Cultural Resources Reports of Surveys Conducted within 0.5 Mile of the Generator Tie-line Corridor

Report Authors and Date	CHRIS Catalogue NADB Numbers	Survey Conducted For
Barnes (2008)	9876*	BLM oil and gas lease area adjacent to generator tie-line route
Davy and Nachmanoff (1999)	3147*	Survey conducted for the SEC AFC of project site and linears
Davy (2000)	7578*	Supplemental survey for the SEC pipeline re-route
Grant (2007)	8954	Geotechnical boring on the Sutter Bypass
Noble (1986)	7140	DEPCO pipeline
Self (1984)	7141*	Greenleaf 1 power plant and gas pipeline

*Located partly within the generator tie-line corridor.
Source: CHRIS NEIC.

The literature search revealed that no cultural resources have been previously recorded within the generator tie-line corridor and its 0.5-mile buffer. The historical maps indicate that a transmission line, roads, and canals are located within or cross the corridor. Sutter Bypass, Boulton Road, Township Road, canals, levees and orchards are located within the 0.5-mile radius.

3.3.1.1 Archaeological Inventory Methods

In connection with this Petition, CCFC conducted a cultural resources field archaeological inventory and architectural reconnaissance of the new generator tie-line and substation. Douglas Davy, Ph.D., RPA, conducted the inventory and reconnaissance on January 15, 2013. The archaeological inventory was conducted by walking the generator tie-line corridor and new substation location in systematic, linear transects, examining the ground for artifacts and archaeological soils. The generator tie-line corridor is located in agricultural access roads that extend from the SEC site to the new substation location. These are one-lane roads, generally 12 feet wide, with a 6-foot shoulder on each side. Across the entire route, they are bordered on one side by drainage or irrigation supply canals and rice fields and on the other by rice fields that are currently flooded. The substation site is currently flooded. Ground visibility in the dirt roads and on the road shoulders was generally good. In the single road segment that was overgrown with grass, the surveyor used a shovel to examine a dirt sample every 20 meters. Two small areas along this route that appear to be suitable for a small laydown yard were also surveyed. The survey encompassed the entire 1.76-mile-long route of the transmission line and covered a total of approximately 6 acres of non-inundated land.

Figure 3.3-1 depicts the areas covered in the intensive pedestrian survey.

3.3.1.2 Archaeological Inventory Results

No prehistoric or historic sites were identified or recorded along the generator tie-line route or in the substation area during the January 15, 2013, survey. Debris noted within the agricultural field roads and on their margins included two metal duck blind tanks discarded on the field road edges, duck hunting debris including duck and goose decoy fragments, a decoy weight, and numerous spent shotgun shell cartridges. In addition, a single piece of glazed white stoneware and a single piece of brick were noted. Neither the stoneware nor the brick were accompanied by other debris or evidence of a historic-era farmstead or other settlement.

3.3.1.3 Native American Consultation

A letter describing the project, as amended, was sent to the Native American Heritage Commission (NAHC) with a request for a search of the Sacred Lands File. The NAHC responded, indicating that there are no traditional cultural properties noted in the Sacred Lands File as being located near the new project facilities. The response letter from the NAHC is included here as Appendix 3.3B. CCFC has contacted Native American individuals and organizations having a traditional interest in the project area to request additional information on Native American resources in the project area and, specifically, along the generator tie-line and in the substation area (Appendix 3.3B).

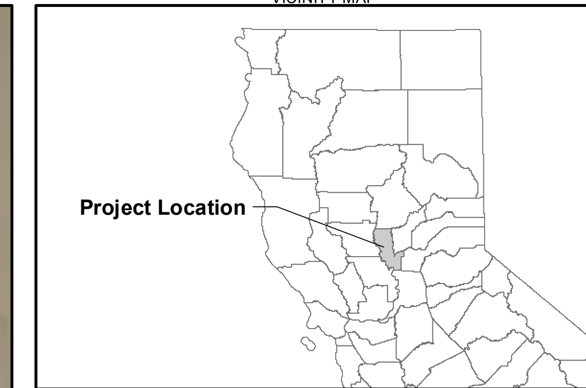
3.3.2 Environmental Consequences

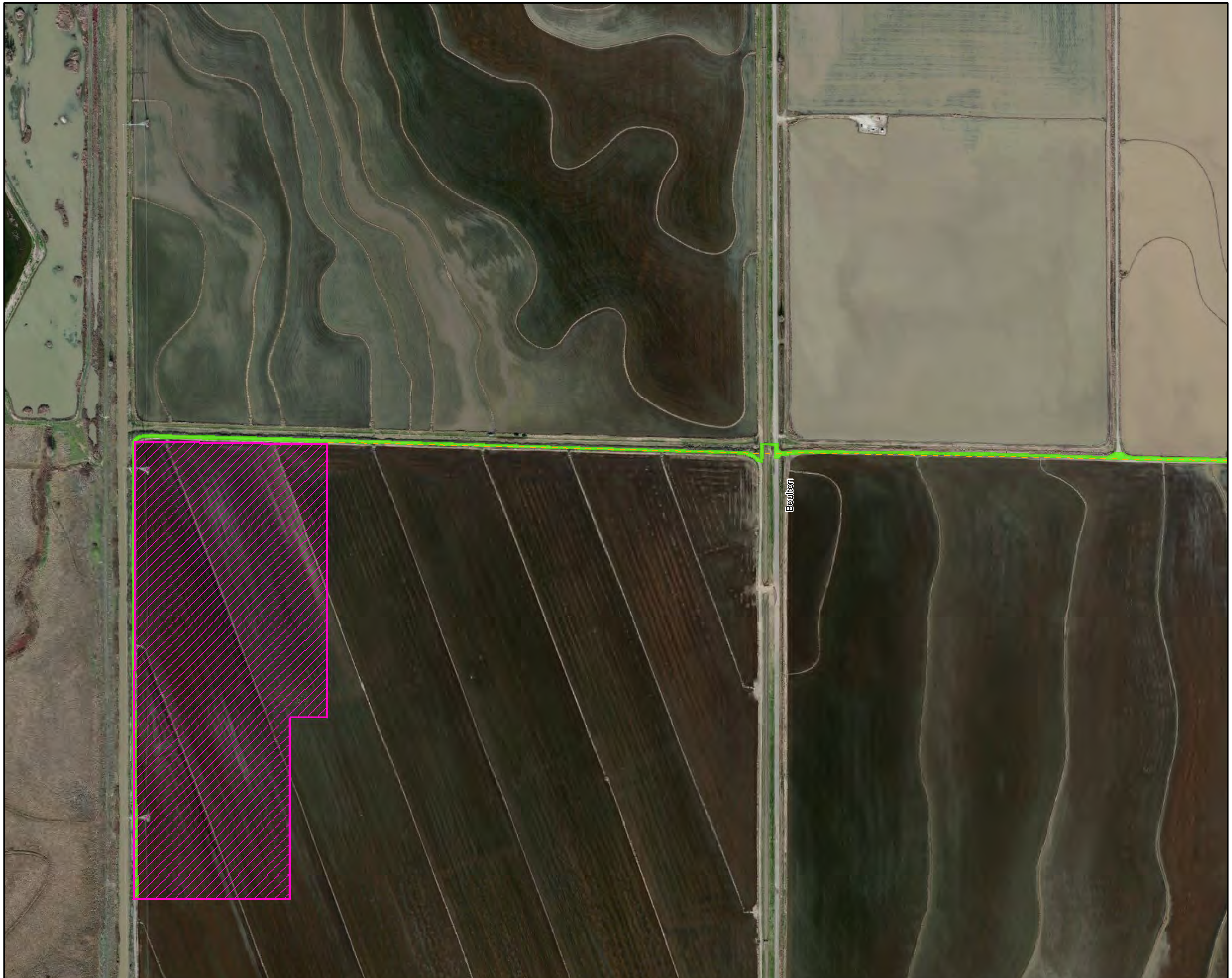
The literature search and surveys did not result in the discovery of cultural or historic resources that the project would affect.

Because the generator tie-line would be constructed underground, there is a possibility that its construction could encounter buried cultural resources such as prehistoric or historic archaeological deposits. The AFC cultural resources report assessed the sensitivity of project areas to encounter buried archaeological deposits and concluded that areas along the SEC natural gas supply pipeline located on or near the natural levees of the Sacramento River would be of high sensitivity and recommended monitoring of construction in these areas (soils of the Shanghai-Nueva-Columbia group). Areas consisting of overflow basins and their low terraces were considered less sensitive and were not recommended for construction monitoring.

The route of the generator tie-line runs entirely in soils derived from drainage basins of the Sacramento River valley and adjacent low terraces (Oswald clay, Gridley clay loam, and Tisdale clay loam). As historical maps show, these areas prehistorically were covered by bulrushes (tules) and other wetlands and were annually inundated during the winter rainy season. Many of these areas are currently under rice cultivation as are all of the areas surrounding the generator tie-line route. These soils are of low archaeological sensitivity because their vegetation and drainage characteristics were poorly suited to human use and habitation. Today, the bulrushes have been replaced by a highly engineered landscape of rice fields and their irrigation supply canals, drainage canals, and access roads with very little human settlement. The probability of generator tie-line trenching encountering buried archaeological deposits is therefore low and construction monitoring is not recommended.

VICINITY MAP





Areas Surveyed

Project Features

Sutter Energy Center

Greenleaf I

Proposed Substation

Western O'Banion Substation

Proposed Underground Generator Tie-Line

N

0 400 800

Feet

FIGURE 3.3-1a
Areas Surveyed for Archaeological Resources
Sutter Energy Center

CH2MHILL.

FIGURE 3.3-1b
Areas Surveyed for Archaeological Resources
Sutter Energy Center

3.3.3 Mitigation Measures

No significant impacts to cultural resources will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.3.4 Consistency with LORS

The construction and operation of the SEC, as amended, will conform with all applicable LORS related to cultural resources.

3.3.5 References Cited

Barnes, James. 2008. *Section 106 compliance for a proposed oil and gas lease in MDM T14N, R2E, Section 24 near Yuba City, Sutter County (case # CA-018-S-SV-08/01)*. Prepared by Bureau of Land Management, Folsom Field Office, February 6, 2008.

Davy, Douglas. 2000. *Archaeological Survey or the Natural Gas Supply Pipeline Reroute, Sutter Power Plant Project*. Prepared by Foster Wheeler Environmental Corporation, Sacramento, CA. Prepared for Calpine Corporation, San Jose, California. March 6, 2000

Davy, Douglas, and Jennifer Nachmanoff. 1999. *Cultural Resources Inventory of the Sutter Power Project, Sutter County, California*. Prepared by Foster Wheeler Environmental Corporation, Sacramento, CA. Prepared for Calpine Corporation, San Jose, California. January 1999.

Grant, Joanne. 2007. *Cultural Resources Report for Geotechnical Borings along the Feather River, Sutter Bypass, and Wadsworth Canal*. Prepared by URS Corporation.

Noble, Daryl. 1986. *Cultural Resource Survey Report: Cultural Resource Survey of the Proposed DEPCO Pipeline*. Prepared by Far Western Anthropological Research Group, Davis, California.

Self, William. 1984. *Cultural Resource Survey Report: Greenleaf Power Plant*. Prepared by Bechtel Group.

3.3.6 Conditions of Certification

SEC does not request changes to the cultural resources Conditions of Certification.

3.4 Geology and Paleontology

The addition of the auxiliary boiler and expansion of the ACC will not cause geological hazards, or impacts to paleontological or geological resources beyond those analyzed by the CEC during certification. The new generator tie-line and substation will result in the disturbance of areas not previously considered. However, no paleontologically sensitive sediments were identified in the area of potential effects at depths relatively near the ground surface where construction will take place. Therefore, the potential to impact paleontological resources is low.

3.4.1 Environmental Baseline Information

Because it has been more than 5 years since the paleontological site records search for this project was conducted, the Project Owner conducted a supplemental records review to update the paleontological sensitivity assessment and assure inclusion of the proposed new generator tie-line and substation site. The records search was conducted online using the University of California Museum of Paleontology (UCMP) database (UCMP, 2013). The record search indicated that there are no newly recorded fossil finds in the vicinity of the project site and new generator tie-line route and substation.

Available geologic maps (Helley and Harwood, 1985) show that the ground surface in this area is covered by relatively young alluvium from the Sacramento River and tributaries. This young alluvium of the Sacramento River natural levees and adjacent low-lying basins is not fossiliferous and is of Holocene age.

The Modesto Formation, which has produced fossils in the past (Jefferson, 1991), underlies the Holocene alluvium throughout the project area. The Modesto Formation consists of a series of alluvial fans forming the western flank of the Sierra Nevada (Marchand and Allwardt, 1981). Like modern alluvial fans, the ancient fans comprising the Modesto Formation experienced episodic deposition followed by long periods of weathering and erosion, as evidenced by the development of ancient soil horizons (termed paleosols in the stratigraphic literature) in the sediments of this formation (Marchand and Allwardt, 1981). In places, these paleosols are cut by ancient river channel deposits (Marchand and Allwardt, 1981), recording the migration of the streams coming off of the Sierra Nevada. The contact between the Modesto Formation and the overlying alluvium increases in depth from east to west. Figure 3.4-1 shows the surficial geology of the project area and indicates that the entire project site is covered by Quaternary basin deposits. The Modesto Formation, upper and lower members, begins to outcrop on the surface just to the east of the SEC facility site along South Township Road. The dividing line between the Quaternary Basin deposits and Pleistocene terraces of the Modesto Formation is also roughly the dividing line today between rice agriculture and orchard farming.

As the literature review for the AFC, updated for this Petition, shows, there are several fossil sites attributed to the Modesto Formation (UCMP localities V3915 and V6426) in the project area, including one site approximately 0.5 miles from the project area. However, the depositional environment in which these fossils were found is unknown. Because the nature of the deposition of the Modesto Formation (episodic deposition followed by long periods of erosion) typically precludes fossil preservation, the formation is considered to have a low paleontological sensitivity. However, pockets of higher-sensitivity material, such as stream or lake deposits, are likely to be present, principally in fluvial facies of the formation

3.4.2 Environmental Consequences

The generator tie-line will be constructed entirely in the younger alluvium overlying the Modesto Formation (Quaternary Basin deposits). This geological unit has not yielded fossils in the project area, and the nature of the unit precludes fossils being present (recent alluvium). The alluvium that will be affected by project activities, therefore, retains a low paleontological sensitivity. It is possible that Modesto Formation deposits underlie the recent alluvium along the generator tie-line route, but this would likely occur at depths below the level of the generator tie-line trench.

Because the project area is overlain by a layer of low-sensitivity sediments, no field survey was conducted and no additional mitigation recommendations are needed.

3.4.3 Mitigation Measures

No changes to previously identified impacts to geological or paleontological resources would result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.4.4 Consistency with LORS

This assessment is consistent with guidelines promulgated by the Society for Vertebrate Paleontology for the evaluation and mitigation of impacts to paleontological resources. The construction and operation of the SEC, as amended, will conform with all applicable LORS related to geological and paleontological resources.

3.4.5 References Cited

Helley, E. J., and D. S. Harwood. 1985. *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California*. Department of the Interior, U.S. Geological Survey Miscellaneous Field Studies Map MF-1790.

Jefferson, G. T. 1991. *A Catalogue of Late Quaternary Vertebrates from California: Part Two, Mammals*. Natural History Museum of California Technical Reports No. 7, 129 p.

Marchand, Denis E., and Alan Allwardt. 1981. *Late Cenozoic stratigraphic units, northeastern San Joaquin Valley, California*. USGS Bulletin: 1470. 70 p.

University of California at Berkeley Museum of Paleontology (UCMP) 2013. UCMP Locality Search. Online: http://ucmpdb.berkeley.edu/loc.html. Accessed January 2, 2013.

3.4.6 Conditions of Certification

Because the proposed project changes would not encounter geological strata different than those described in the AFC and are not likely to adversely affect paleontological resources, this Petition does not require changes to the geology and paleontology Conditions of Certification.

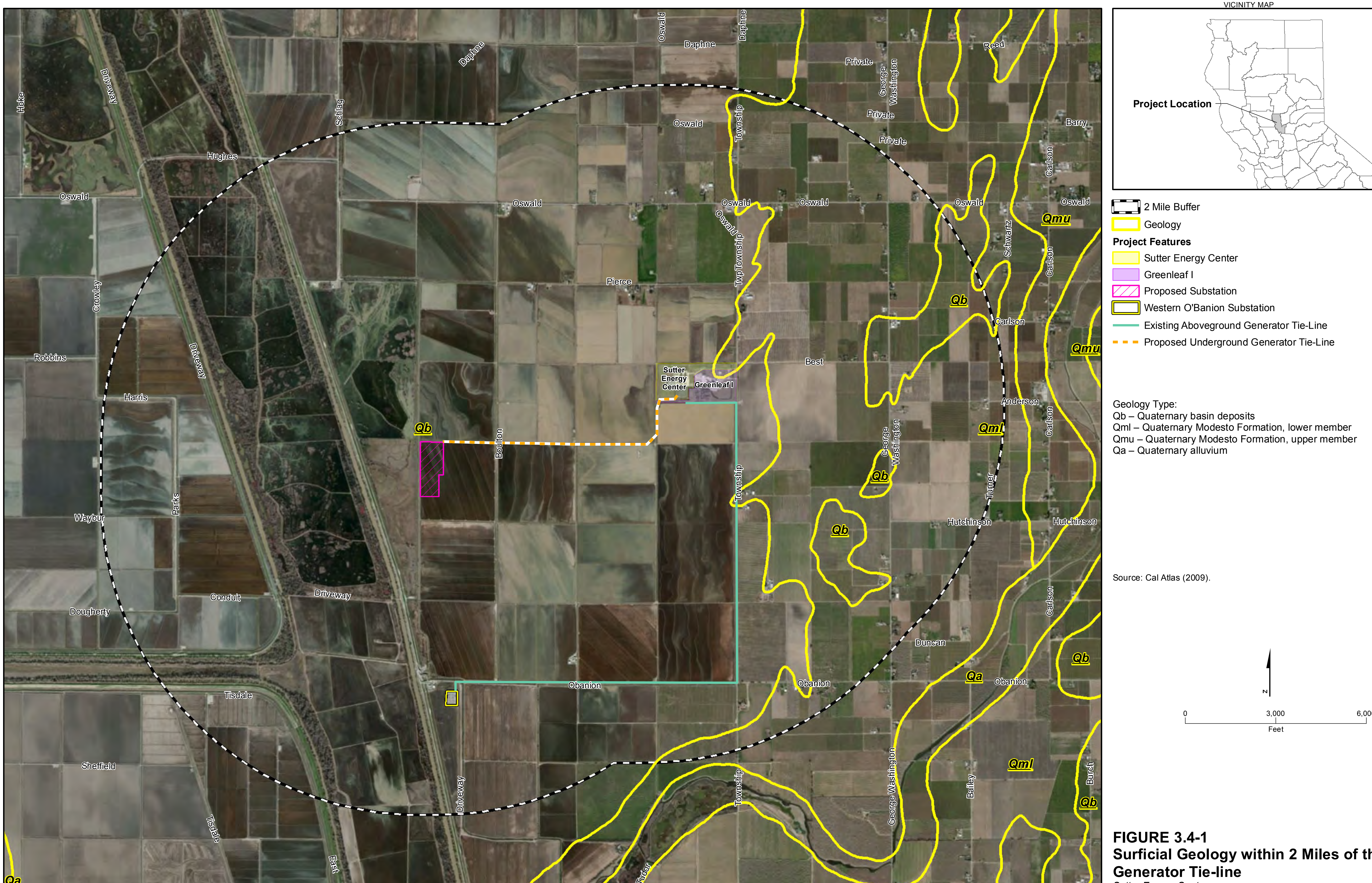


FIGURE 3.4-1
Surficial Geology within 2 Miles of the Generator Tie-line
Sutter Energy Center

CH2MHILL

3.5 Hazardous Materials Management

The addition of the auxiliary boiler and expansion of the ACC and construction of a new generator tie-line and substation will not result in potential impacts in terms of hazardous materials management that are different than those discussed in the Commission Decision. Additionally, the auxiliary boiler and ACC construction will not result in changes to the chemical inventory for the project. As a result, any potential hazardous materials impacts associated with this Petition will be less than significant.

3.5.1 Environmental Baseline Information

The chemical list provided in the AFC has not changed as a result of the project equipment or interconnection modifications. There will be no new chemicals required as a result of the auxiliary boiler addition and ACC expansion and it will also not be necessary to increase the quantities of hazardous materials currently used. Storage locations for the hazardous materials that will be used during operation, health hazards and flammability data, and information about these materials, including trade names, chemical names, Chemical Abstract Service numbers, maximum quantities onsite, reportable quantities, California Accidental Release Program threshold quantities, and status as a Proposition 65 chemical (a chemical known to be carcinogenic or cause reproductive problems in humans) are unchanged and can be found in the original AFC.

3.5.2 Environmental Consequences

Although the auxiliary boiler will require the use of ammonia, the existing ammonia tank and number of ammonia deliveries will remain consistent with that described in the AFC. No additional hazardous materials storage is needed (i.e., lube oil). Therefore, no new significant impacts to hazardous materials would result from the project modifications. Hazardous materials will be handled and stored in a safe manner and in accordance with the Hazardous Materials Business Plan, Risk Management Plan, and documents, reducing any potential public health or safety hazards.

3.5.3 Mitigation Measures

No significant impacts in terms of hazardous materials handling will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.5.4 Consistency with LORS

The construction and operation of the SEC, as amended, will conform with all applicable LORS related to hazardous materials.

3.5.5 Conditions of Certification

SEC does not request changes to the hazardous material management Conditions of Certification.

3.6 Land Use

The construction of the auxiliary boiler and ACC expansion would not change the land uses associated with the SEC. The addition of the generator tie-line and substation would involve new land uses that are similar to or the same as those considered in the Commission Decision for the existing generator tie-line and O'Banion Substation, but in a different location. The addition of these features, however, would not have significant effects in terms of land use beyond those considered in the Commission Decision.

3.6.1 Environmental Baseline Information

Under the 2012 Sutter County General Plan, the SEC power plant site has a General Plan Land Use designation of Industrial in the Sutter County General Plan (Sutter County, 2010; 2012) and the property is zoned M-2, General Industrial, with a Planned Development combining designation. The purpose of the M-2 zoning classification is to:

> … provide areas for a full range of industrial, manufacturing and related uses to expand the economic base, employment opportunities and provide for the general welfare. Due to potential high intensity operational characteristics and features, this district should be located away from residential neighborhoods and other potentially sensitive uses (Sutter County Zoning Code, Sutter County Ordinance Code, §1500-4910).

The new generator tie-line and substation will be constructed in areas having a General Plan Designation of Agriculture, 80-acre minimum parcel size, and a zoning designation of AG, Agriculture. Figure 3.6-1 shows the General Plan land use designations within 1 mile of the project site and new generator tie-line route.

3.6.2 Environmental Consequences

No significant impact to land use will result from the changes proposed as part of this Petition. Specifically, the proposed project changes will not physically divide an established community; conflict with applicable land use plans, policies, or regulations; or conflict with an applicable habitat conservation plan.

The SEC is an industrial land use that is consistent with current Sutter County zoning and land use designations (Zoning of M-2 PD, General Industrial, Combining Planned Development) (Sutter County, 2010; 2012). The addition of the auxiliary boiler and expansion of the ACC are consistent with the existing industrial land use and zoning designations of the property. The Commission Decision's conclusion that the facility will be consistent with surrounding land uses and will not physically divide any elements of the local community remains valid with the addition of the equipment and interconnection modifications.

The newly proposed generator tie-line and substation will be located in an area zoned for agricultural use (AG zoning district). Utility substations and transmission lines are conditionally permitted uses in an AG zone. The proposed generator tie-line and substation would therefore be consistent with current zoning in the area and, if not for the exclusive jurisdiction of the CEC to license thermal power plants with a nominal generating capacity of more than 50 MW, would require Conditional Use Permits from Sutter County and encroachment permits from the Sutter Extension Water District.

3.6.3 Mitigation Measures

No significant impacts to land use will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not recommended.

3.6.4 Consistency with LORS

The construction and operation of the SEC, as amended, will conform to all applicable LORS related to land use.

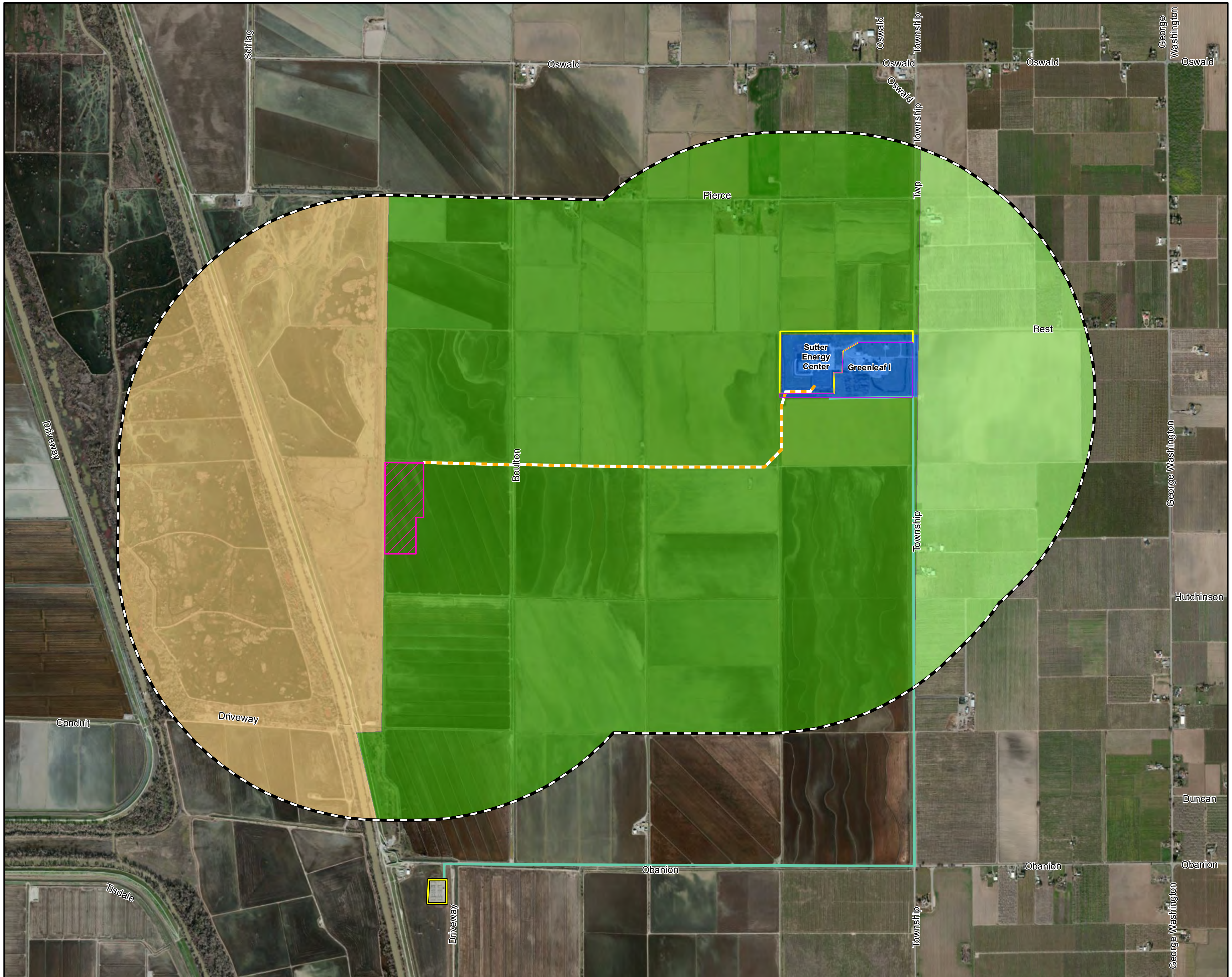
3.6.5 References Cited

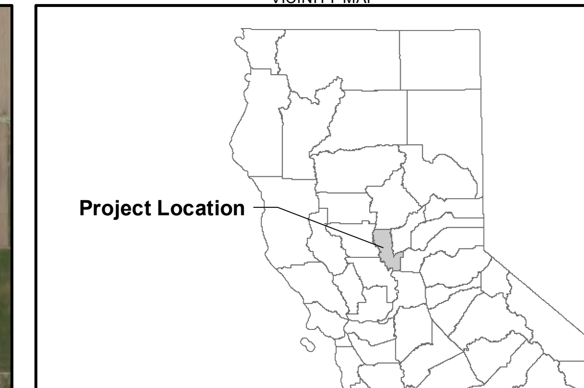
Sutter County. 2010. Sutter County Zoning Code. December 2010. Available online at: http://www.co.sutter.ca.us/doc/government/depts/cs/ps/cs_planning_services

Sutter County. 2012. Sutter County General Plan & Zoning Maps. October 2012. Available online at: http://www.co.sutter.ca.us/doc/government/depts/cs/ps/cs_general_plan

3.6.6 Conditions of Certification

SEC does not request changes to the land use Conditions of Certification.





1 Mile Buffer

General Plan

- Industrial
- Agriculture - 20 Acre Minimum Parcel Size
- Agriculture - 80 Acre Minimum Parcel Size
- Open Space

Project Features

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation
- Existing Aboveground Generator Tie-Line
- Proposed Underground Generator Tie-Line

Source: Sutter County, (October, 2012).

N

0 2,000 4,000
Feet

FIGURE 3.6-1
General Plan Land Use Designations within 1 Mile of the Generator Tie-Line
Sutter Energy Center

SAC P:\SUTTER_ENERGY_CENTER\MAPFILES\SEC_GP.MXD GPERDEW 2/19/2013 12:07:32 PM

CH2MHILL.

3.7 Noise and Vibration

The auxiliary boiler and ACC expansion will add new sources of noise to the SEC. For this reason, this Petition includes a noise modeling analysis of these equipment and interconnection modifications. The analysis demonstrates that the reconfigured project will not result in significant adverse noise impacts.

3.7.1 Environmental Baseline Information

Land use development intensity in the project area has not changed significantly since the ambient noise survey was conducted for the AFC. In addition, a review of sensitive receptors shows that there are no new sensitive receptors in the project area. An internal CCFC noise monitoring program was conducted in December 2011 to verify regulatory compliance with required noise standards. Monitoring was conducted for a 24-hour period at the four AFC-identified noise receptor locations (see Table 3.7-1) and at the northwest corner of the plant site. The noise levels measured at the plant site were all within the range of 62 dBA to 64 dBA, indicating that facility noise was very steady and did not vary appreciably over the 24-hour period. This allowed the plant noise contribution at the noise receptors to be evaluated on the basis of the L_{90} (the level equaled or exceeded 90 percent of the time) as the higher levels occurring less often could be attributed to other noise sources. No data were obtained from Site 4 because of equipment malfunction. However, almost all of the data were recovered from the other three sites and Site 4 is the most distant from the power plant. The 2011 noise study is included here as Appendix 3.7A.

Review of the charts presented in the monitoring report indicates that the SEC noise contribution at Sites 1 and 2 is not greater than 43 dBA. The SEC noise contribution at Site 3 is no more than 40 dBA. Site 4 is farther from the SEC than the other three receptors, so the SEC noise contribution there is expected to be less than at the other three receptors. The expected and worst case current SEC noise levels at each receptor, based on the results in the December 2011 CCFC report, are listed in Table 3.7-1.

TABLE 3.7-1
Estimated Current SEC Noise Contribution at Nearby Receptors, dBA

Receptor	Location	Expected	Worst Case
Site 1	4879 South Township Road	40	43
Site 2	4660 South Township Road	40	43
Site 3	4466 Pierce Road	40	40
Site 4	5794 South Township Road	40	40

3.7.2 Environmental Consequences

The installation of an auxiliary boiler and ACC expansion have the potential to increase the SEC's noise contribution to the total noise levels at offsite receptors. These changes were evaluated by:

- Obtaining or estimating the noise source strength of the new equipment
- Modeling the noise contributed by the new equipment at the nearby receptors that have been used previously for compliance determination
- Reviewing available monitoring information at the nearby receptor locations to quantify the noise levels currently contributed by the operation of the existing SEC at those locations
- Estimating the future SEC total operational noise levels at the nearby receptors after the startup of the additional ACC streets and the auxiliary boiler
- Estimating SEC's compliance with the applicable Sutter County Noise Level Standards with the addition of the ACC expansion and the auxiliary boiler.

The addition of the substation has the potential to increase noise also, but the noise levels will be sufficiently low that they will not affect nearby activities, such as duck hunting.

3.7.2.1 Air-cooled Condenser

Information on noise from two new ACC streets was provided by SPX, a major supplier of ACCs and other power plant cooling equipment, in a formal cost proposal to CCFC. The far-field sound pressure level at 400 feet is stated to be 57 dBA ± 2dBA. Therefore, the guaranteed noise level would likely be 59 dBA at 400 feet. The accuracy of noise modeling at relatively large distances to the nearest receptors as is required here (≥2,800 feet), is greatly improved if information on the frequency distribution of their noise is used in the calculations. Although SPX did not provide frequency distribution data in its proposal for SEC, a typical distribution was available from information for other power plants. Use of these data resulted in the estimate of the octave band sound power levels for the additional two ACC streets in Table 3.7-2.

TABLE 3.7-2
Estimated Sound Power Levels for Additional Two ACC Streets

Category	Sound Power Levels by Octave Band, dB Linear									Total Sound Power Levels, dB	
Octave Band Center Frequency, hertz	31.5	63	125	250	500	1000	2000	4000	8000	A	Linear
Sound Power Levels, dB re 10-12 watt	115.0	112.0	110.5	108.6	105.9	102.6	100.8	97.6	93.5	108.7	118.7

3.7.2.2 Auxiliary Boiler

Vendor-supplied noise data for an auxiliary boiler were not available. However, an approach for estimating auxiliary boiler octave band and total sound power levels was found in the *Handbook of Acoustics*, Malcolm J. Crocker, 2007. The approach presented a mathematical relationship between the rated capacity of the auxiliary boiler and the A-weighted sound power level. A table of adjustments was also provided to derive octave band sound power levels from the total A-weighted sound power level. The mathematical relationship used MW as the unit of boiler rating. Unit conversions were also provided to convert different units of boiler rating. The available information was that the auxiliary boiler would be rated for a 130 million BTU per hour (MMBtu/hr) input. A boiler output of 97.5 MMBtu/hr was calculated assuming a fuel-to-steam efficiency of 75 percent. This output was estimated to be equivalent to 28.6 MW using the conversion factors provided in the reference. It was stated in the reference that the MW-to-sound power level (PWL) relationship is valid over a range of 0.5 MW to 20 MW. The rated capacity of the SEC's auxiliary boiler will be nearly 50 percent higher than the high end of this range. However, the approach in the reference was used because no other information was readily available and the relationship between these variables indicated that the PWL was only affected as 4 log (MW) over this range. This indicates that the 50 percent increase in boiler rating (at least for the published range) would increase the PWL by only 0.7 dBA.

Use of this approach resulted in the estimate of the octave band sound power levels for the auxiliary boiler in Table 3.7-3.

TABLE 3.7-3
Estimated Sound Power Levels for the Auxiliary Boiler

Category	Sound Power Levels by Octave Band, dB Linear									Total Sound Power Levels, dB	
Octave Band Center Frequency, hertz	31.5	63	125	250	500	1000	2000	4000	8000	A	Linear
Sound Power Levels, dB re 10-12 watt	102.8	102.8	101.8	99.8	96.8	93.8	90.8	87.8	84.8	99.6	108.6

3.7.2.3 Modeling of New Equipment Noise at Offsite Receptors

The estimated sound power levels for the new auxiliary boiler and ACC expansion were input to the CadnaA® model to estimate their noise levels at the four nearby receptors that have been used for compliance evaluation. This model implements the methodologies in ISO 9613-2 *Acoustics – Sound Attenuation During Propagation Outdoors*. Octave band sound power levels or sound pressure levels at a reference distance from each noise source are the basic input to the model. Other input includes base facility maps or drawings or aerial photographs locating the noise sources, building data, ground and atmospheric conditions, and details on techniques used for noise control, if any. The model divides the noise sources into individual point, area, and vertical area sources representing each piece of equipment or structure that produces a significant amount of noise or shielding. Using these power levels as a basis, the model calculates the sound pressure level that would occur at specific locations from each source after losses due to distance, air absorption, ground effects, and the barrier effects of buildings and terrain are considered. The noise contributions from all of the sources are logarithmically added for each receptor location to determine the total facility noise. Noise levels can be presented for specific locations, as contours, or both.

The model was set up to predict the noise levels from the additional equipment on the SEC site as noise level contours and as noise levels at the specified receptor locations shown in Table 3.7-4. The estimated noise levels from the ACC additions and the auxiliary boiler are also shown separately and as the total of the two additions.

TABLE 3.7-4
CadnaA® Model Results – New Auxiliary Boiler and ACC Expansion

Receptor	Location	ACC Additional 2 Streets	Auxiliary Boiler	Total – ACC plus Auxiliary Boiler Additions
Site 1	4879 South Township Road	33.2	29.6	35
Site 2	4660 South Township Road	31.3	27.3	33
Site 3	4466 Pierce Road	31.6	27.6	33
Site 4	5794 South Township Road	29.1	23.6	30

3.7.2.4 Estimated Future SEC Total Operational Noise Levels

The estimated total future SEC operational noise levels at the four nearby receptors are listed in Table 3.7-5. They are listed for both expected and worst case current SEC noise. The standard practice in acoustical engineering is to conduct all calculations to the nearest 0.1 dB (when noise level data to this degree of precision are available) and to present the final results of all calculations to the nearest whole decibel. However, the noise levels in Table 3.7-5 are all presented to the nearest 0.1 dB so the level of change can be more accurately evaluated.

TABLE 3.7-5
Estimated Future SEC Total Operational Noise Levels, dBA

	Estimated Current SEC Noise		Estimated Future SEC Noise with Additional Equipment		Estimated Increase In Noise over Existing	
Receptor	Expected	Worst Case	Expected	Worst Case	Expected	Worst Case
Site 1	40	43	41.1	43.6	1.1	0.6
Site 2	40	43	40.8	43.4	0.8	0.4
Site 3	40	40	40.8	40.8	0.8	0.8
Site 4	40	40	40.4	40.4	0.4	0.4

3.7.2.5 Estimated Future Compliance Status

The Sutter County Noise Level Standards are hourly L_{eq} limits of 50 dBA during the daytime (7:00 am to 10:00 pm) and 45 dBA during the nighttime (10:00 pm to 7:00 am). The estimated SEC future noise levels in Table 3.7-5 are all less than 42 dBA for the expected case and a maximum of 44 dBA for the worst case. The levels in all cases are less than the most stringent limit, which is the Sutter County nighttime limit of 45 dBA. Additionally, the maximum SEC noise level increase is predicted to be 1.1 dBA. The threshold for the change in noise level generally considered to be noticeable is 3 dBA. Also, the total noise at the receptor locations appears to often be dominated by non-SEC noise sources. This would make the small change in SEC noise even less noticeable for much of the time at the receptor locations.

3.7.3 Mitigation Measures

No significant impacts to noise will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.7.4 Consistency with LORS

Design, construction and operation of the SEC, with the modifications proposed in this Petition will: (1) conform to all worker safety and health noise limits, (2) be conducted in accordance with applicable LORS relating to project noise, and (3) conform with the Conditions of Certification. The noise from the SEC, as amended, will remain below all applicable noise standards.

3.7.5 References Cited

Crocker, Malcolm J. (ed.) 2007. *Handbook of Acoustics*. J. W. Wiley and Sons, Inc. New York.

3.7.6 Conditions of Certification

SEC does not request changes to the noise Conditions of Certification.

3.8 Public Health

This section presents the methodology and results of the revised human health risk assessment (HRA) performed to assess potential impacts and public exposure associated with airborne emissions from the proposed equipment and interconnection modifications.

Air will be the dominant pathway for public exposure to chemical substances released as a result of the modifications to SEC. Emissions to the air will consist primarily of combustion byproducts produced by the auxiliary boiler. Potential health risks from facility-wide emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways (e.g., soil ingestion, dermal exposure, mother's milk exposure) were included in the health risk modeling; however, direct inhalation is considered the most likely exposure pathway. The HRA was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA) and the California ARB.

Emissions for which CAAQSs or NAAQSs are established, including NO_x, CO, SO_x, and particulate matter are addressed in Section 3.1, Air Quality. However, some discussion of the potential health risks associated with these substances is presented in this section. Human health risks associated with the potential accidental release of stored acutely hazardous materials are discussed in Section 3.5, Hazardous Materials Management.

3.8.1 Environmental Baseline Information

According to the Auer land use classification scheme, land uses within a 3-kilometer radius boundary around the SEC site are overwhelmingly rural (agricultural). This is consistent with the current land use and zoning designation for the site.

SEC is situated in Census Tract No. 510, which has a population of 2,461 (2010 data) individuals. The following census tracts in the area may be affected by the facility emissions:

- Tract 505.03, population 6,966
- Tract 505.04, population 7,163
- Tract 504.02, population 3,970
- Tract 508, population 3,460
- Tract 509, population 1,561

Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure. Schools, both public and private, day care facilities, convalescent homes, and hospitals are of particular concern. Eight sensitive receptors were identified within an approximate 6-mile radius of SEC. Table 3.8-1 lists receptors within approximately a 10-mile radius.

TABLE 3.8-1
Sensitive Receptors in the SEC Region

Receptor ID	Receptor	UTM Coordinates (E/N), m	Elevation, Ft (amsl)	Distance (miles)
1	Sutter Union High School	607464, 4336057	86	8.2
2	Brittan Elementary School	608276, 4335511	69	7.8
3	Grand Island Elementary School	595423, 4325094	42	10.6
4	Central Gaither Elementary School	615739, 4318154	38	3.4
5	Cobblestone Elementary School	625428, 4317890	42	8.5
6	Riverside Meadows Intermediate School	625813, 4316904	46	8.6
7	Rio Del Oro Elementary School	625320, 4319059	44	8.1
8	Plumas Lake Elementary School	628459, 4320893	63	9.7
9	Arboga Elementary School	624967, 4323369	54	7.5
10	Olivehurst Elementary School	625240, 4326266	59	7.9

TABLE 3.8-1
Sensitive Receptors in the SEC Region

Receptor ID	Receptor	UTM Coordinates (E/N), m	Elevation, Ft (amsl)	Distance (miles)
11	Lindhurst High School	626505, 4327032	63	8.6
12	Yuba Gardens School	625792, 4327535	62	8.4
13	Yuba Sutter Head Start	625313, 4328095	63	8.2
14	Ella Elementary School	625166, 4328292	63	8.2
15	Yuba City Charter School	619400, 4329018	56	5.3
16	Daycare (DC)	616708, 4329321	52	4.3
17	Lincrest Elementary School	618388, 4329544	53	5.0
18	Lincoln Elementary School	617376, 4330016	52	4.9
19	Andros Karperos Middle School	617067, 4331327	54	5.4
20	St. Isidore Catholic School	618822, 4331398	53	6.0
21	Yuba City High School	618740, 4332009	55	6.3
22	Cambridge Junior College	616534, 4333157	57	6.4
23	River Valley High School	615853, 4332958	56	6.0

All coordinates from Google Earth (center location of each receptor location).
Based on an approximate 10-mile-radius area search.

Air quality and health risk data presented by ARB in the 2009 Almanac of Emissions and Air Quality for the State shows that over the period from 1990 through 2008, the average concentrations for the top 10 toxic air contaminants (TAC) have been substantially reduced, and the associated health risks for the state are showing a steady downward trend as well. This same trend is expected to have occurred in the Sacramento Valley Air Basin (SVAB). ARB-estimated emissions inventory values for the top 10 TACs for 2008 are presented in Table 3.8-2 for the state, SVAB and Sutter County. SEC has not identified and is not aware of any public health studies prepared by the local health department or the air district, related to respiratory illnesses, cancers, or related diseases concerning the local area within a 6-mile radius of SEC.

TABLE 3.8-2
Top Ten Toxic Air Contaminants

TAC	Statewide 2008 Emissions (tons/yr)	SVAB 2008 Emissions (tons/yr)	Sutter County 2008 Emissions (tons/yr)
Acetaldehyde	9103	986	52
Benzene	10794	957	68
1,3 Butadiene	3754	437	11
Carbon tetrachloride	4.04	0.05	0
Chromium 6	0.61	0.04	<0.01
Para-Dichlorobenzene	1508	108	4
Formaldehyde	20951	2045	125
Methylene Chloride	6436	352	10
Perchloroethylene	4982	355	12
Diesel Particulate Matter	35884	2590	182

The existing health risk values for the turbines and duct burners were established by CEC staff in the Final Commission Decision, dated April 1999, as follows:

- Acute Non-cancer Hazard Index = 0.01
- Chronic Non-cancer Hazard Index = 0.02
- Cancer risk = 0.02 x 10^{-6}

These existing values are well below the established state significance levels as delineated in Table 3.8-4 below.

3.8.2 Environmental Baseline Information

3.8.2.1 Emissions Risk Significance Criteria

Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (that is, a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk greater than 10 in a million due to a project is considered to be a significant impact on public health. For example, the 10 in a million risk level is used by the Air Toxics Hot Spots (California Health and Safety Code [CHSC] 44300 et seq.) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

Non-Cancer Risk

Non-cancer health effects can be classified as either chronic or acute. In determining the potential health risks of non-cancerous air toxics, it is assumed there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non-cancer health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this HRA, all hazard quotients were summed regardless of target organ. This method leads to a conservative, upper-bound assessment. RELs used in the hazard index calculations were those published in the ARB/OEHHA listings dated May 2012 (see Appendix 3.8A).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure (i.e., typically over a lifetime of 70 years) caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard quotients calculated with annual concentrations.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure over periods ranging from 1 to 8 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the exposure duration is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard quotients are typically summed to calculate the acute hazard index. Average short-term modeled concentrations are divided by acute RELs to obtain a hazard index for health effects caused by short-term exposure to air toxics.

3.8.2.2 Construction Phase Impacts

The construction phase of the equipment modifications and generator tie-line is expected to take approximately 9 months. No significant public health effects are expected during the construction phase. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed. In addition, mitigation measures to reduce air emissions from construction will be implemented as described in Section 3.1, Air Quality.

Temporary emissions from construction-related activities are discussed in Section 3.1. Ambient air modeling for PM_{10}, $PM_{2.5}$, CO, SO_2, and NO_x was performed as described in Section 3.1. Construction-related emissions are temporary and localized, resulting in no long-term impacts to the public.

Small quantities of hazardous waste may be generated during the construction phase. Hazardous waste management plans will be in place so the potential for public exposure is minimal. Refer to the Waste Management section, for more information. No acutely hazardous materials will be used or stored onsite during construction (see Section 3.5, Hazardous Materials Management). To ensure worker safety during construction, safe work practices will be followed (see Section 3.14, Worker Safety and Fire Protection).

3.8.2.3 Operational Phase Impacts from Emissions

Environmental consequences potentially associated with the operation of SEC, as modified to include an auxiliary boiler and expanded ACC, include potential human exposure to chemical substances emitted to the air. The human health risks potentially associated with these chemical substances were evaluated in an HRA. The chemical substances potentially emitted to the air from the proposed auxiliary boiler are listed in Table 3.8-3. The ACC expansion and generator tie-line would not result in additional air emissions and are not considered further in this emissions analysis.

TABLE 3.8-3
Chemical Substances Potentially Emitted to the Air from the Auxiliary Boiler

Pollutant	Lb/hr	Lb/yr
Acetaldehyde	0.00114	10
Acrolein	0.000582	5.1
Benzene	0.000556	4.87
Ammonia	0.53	4640
1,3 Butadiene	0	0
Ethylbenzene	0.00123	10.7
Formaldehyde	0.00219	19.2
Hexane	0.000813	7.12
Naphthalene	0.0000387	0.339
PAHs	0.0000516	0.452
Propylene	0.0943	826
Propylene Oxide	0	0
Toluene	0.00472	41.4
Xylenes	0.00351	30.7

Emissions of criteria pollutants will adhere to NAAQS and CAAQS, as discussed in Section 3.1, Air Quality. The facility will also include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under FRAQMD rules. Offsets will be required due to the facility’s status as a major source. Air dispersion modeling results (presented in Section 3.1) show emissions will not result in concentrations of criteria pollutants in air that exceed ambient air quality standards (either NAAQS or CAAQS). These standards are intended to protect the general public with a wide margin of safety. Therefore, the facility, as modified, is not anticipated to have a significant impact on public health from emissions of criteria pollutants.

Potential impacts associated with emissions of toxic pollutants to the air from the proposed modifications were addressed in an HRA, presented in Appendix 3.8A. The HRA was prepared using guidelines developed by OEHHA and ARB, as implemented in the latest version of the Hotspots Analysis and Reporting Program (HARP) model (Version 1.4f).

Public Health Impact Study Methods

Emissions of toxic pollutants potentially associated with the facility were estimated using emission factors approved by ARB and USEPA. Concentrations of these pollutants in air potentially associated with the facility emissions were estimated using AERMOD, with the results imported into the HARP program. Modeling allows the estimation of both short-term and long-term average concentrations in air for use in an HRA, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the maximum impact receptor (MIR). The hypothetical MEI is an individual assumed to be located at the MIR location, which is assumed (for purposes of this worst-case analysis) to be a residential receptor where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on the air dispersion modeling. Human health risks associated with emissions from the facility are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any location in the vicinity of the facility. The highest off-site concentration location represents the MIR/MEI, unless the receptor is clearly eliminated from consideration by virtue of the receptor location type, i.e., a roadway location, riverbed location, established park or recreational area location, lake surface location, etc.

Health risks potentially associated with concentrations of carcinogenic air pollutants were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in air over a 70-year lifetime. Evaluation of potential non-cancer health effects from exposure to short-term and long-term concentrations in air was performed by comparing modeled concentrations in air with the RELs. An REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in air were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (ARB, 2012), and are presented in Appendix 3.8A. Emissions of toxic and/or hazardous pollutants for the various processes are presented in Appendix 3.8A.

Characterization of Risks from Toxic Air Pollutants

The excess lifetime cancer risk associated with air emissions from the auxiliary boiler for the MIR location is estimated to be 6.71×10^{-6}. Excess lifetime cancer risks less than 10×10^{-6} (with toxics best available control technologies [T-BACT]) are unlikely to represent significant public health impacts that require additional controls of facility emissions. Risks higher than 1×10^{-6} may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population, and toxicity of the risk-driving chemicals. Health effects risk thresholds are listed in Table 3.8-4. Risks associated with pollutants potentially emitted from the auxiliary boiler are presented in Table 3.8-5. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 3.8A. As described previously, human health risks associated with emissions from the auxiliary boiler are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely there would be significant impacts in any other location in the vicinity of the SEC.

TABLE 3.8-4
Significant Health Effect Threshold Levels for California*

Risk Category	Risk Threshold
Cancer Risk	>1.0 x 10^{-6} without T-BACT >10 x 10^{-6} with T-BACT
Chronic Hazard Index	>1.0
Acute Hazard Index	>1.0
Cancer Burden	>1.0

*FRAQMD Rule 10-7 (Air Toxics NSR) does not state risk-based limits; therefore, the standard statewide values were used as the significance thresholds. This is consistent with the methods used in the original AFC/CEC analysis.

TABLE 3.8-5
HRA Summary, Auxiliary Boiler

Risk Category	MIR Project Values	Applicable Significance Threshold
Cancer Risk	6.71 E-6	See Table 3.8-4
Chronic Hazard Index	0.00903	
Acute Hazard Index	0.00533	
Cancer Burden*	0.000025	

MIR Receptor #: 13172, 612820mE, 4323558mN
Acute MIR #: 13189, 612897mE, 4323470mN, Acute HI at the Acute MIR = 0.00950
*The 1.0 x 10^{-6} isopleth radius is located less than 3,000 feet from the site center. The estimated normalized population within this area is less than 25 individuals.

Cancer risks potentially associated with auxiliary boiler emissions were also assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the auxiliary boiler. Cancer burden is calculated as the worst-case product of excess lifetime cancer risk (at the 1 x 10^{-6} cancer risk level and isopleth distance) and the number of individuals at that risk level. The 1 x 10^{-6} isopleth radius is approximately 3,000 feet from the auxiliary boiler stack. The estimated normalized population within this radius is less than 25 individuals. The calculated cancer burden for the operation of the auxiliary boiler is therefore 0.000025.

The risks from emissions of toxic pollutants from the auxiliary boiler, when added to the existing SEC combustion turbine risk values, per the CEC Final Decision of April 1999, result in values well below the existing significance levels per Table 3.8-4. (This addition was accomplished without regard to receptor locations for the two analyses, i.e., the maximum individual cancer risk [MICR] values were added to derive a worst case value for each risk category.) These values are as follows:

- Chronic Non-cancer Hazard Index = 0.02903
- Acute Non-cancer Hazard Index = 0.01533
- Maximum impact cancer risk = 6.73 x 10^{-6}

As described previously, human health risks associated with emissions from the facility are unlikely to be higher at any other location than at the location of the MIR. Therefore, the risks for all of these individuals would be lower (and in most cases, substantially lower) than 6.73 x 10^{-6}. The estimated cancer burden is 0.0, indicating emissions from the facility would not be associated with any increase in cancer cases in the previously defined population. As stated previously, the methods used in this calculation considerably overstate the potential cancer burden, further suggesting that facility emissions are unlikely to represent a significant public health impact in terms of cancer risk.

The acute and chronic non-cancer hazard quotients associated with concentrations in air from the auxiliary boiler are shown in Table 3.8-5. The acute and chronic non-cancer hazard quotients for all target organs fall well below 1.0. As described previously, a hazard quotient less than 1.0 is unlikely to represent a significant impact to public health. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 3.8A. As described previously, human health risks associated with emissions from the addition of the auxiliary boiler are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely there would be significant impacts in any other location in the vicinity of SEC.

Detailed risk and hazard values are provided in the HARP output presented in Appendix 3.8A (electronic files on CD). No specific health related studies were identified which pertain to the local area for any identified toxic air pollutant or identified specific population.

The estimates of excess lifetime cancer risks and non-cancer risks associated with chronic or acute exposures fall below thresholds used for regulating emissions of toxic pollutants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Since risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have estimated such risks by extrapolation from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans. In other words, the assumption is that humans are as sensitive as the most sensitive animal species. Therefore, the true risk is not likely to be higher than risks estimated using unit risk factors and is most likely lower, and could even be zero.

An excess lifetime cancer risk of 1×10^{-6} is typically used as a screening threshold of significance for potential exposure to carcinogenic substances in air. The excess cancer risk level of 1×10^{-6}, which has historically been judged to be an acceptable risk, originates from efforts by the Food and Drug Administration (FDA) to use quantitative HRA for regulating carcinogens in food additives in light of the zero tolerance provision of the Delaney Amendment to the Food, Drugs, and Cosmetic Act of 1938 (Hutt, 1985). The associated dose, known as a "virtually safe dose," has become a standard used by many policy makers and the lay public for evaluating cancer risks. However, a study of regulatory actions pertaining to carcinogens found that an acceptable risk level can often be determined on a case-by-case basis. This analysis of 132 regulatory decisions found that regulatory action was not taken to control estimated risks below 1×10^{-6} (one in a million), which are called de minimis risks. De minimis risks are historically considered risks of no regulatory concern. Chemical exposures with risks above 4×10^{-3} (four in ten thousand), called "de manifestis" risks, were consistently regulated. "De manifestis" risks are typically risks of regulatory concern. The risks falling between these two extremes were regulated in some cases, but not in others (Travis et al., 1987).

The estimated lifetime cancer risks to the maximally exposed individual located at the MIR are well below the 10×10^{-6} significance level (with T-BACT). These risk estimates were calculated using assumptions that are highly health protective. Evaluation of the risks associated with the emissions from the auxiliary boiler should consider that the conservatism in the assumptions and methods used in risk estimation considerably overstate the risks from its emissions. Based on the results of this HRA, there are no significant public health impacts anticipated from emissions of toxic pollutant to the air from the addition of the auxiliary boiler.

3.8.2.4 Hazardous Materials

The hazardous materials inventory will not change as a result of the equipment modifications. Use of chemicals will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, accidental releases that migrate off-site could result in potential impacts to the public.

The California Accidental Release Program regulations (CalARP) and Code of Federal Regulations Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. SEC has a Risk Management Plan, which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of a program listed hazardous material. No additional hazardous materials will result from the project modifications.

3.8.2.5 Operation Odors

The addition of the auxiliary boiler, expansion of the ACC, and construction of the generator tie-line are not expected to emit any substances that could cause objectionable odors.

3.8.2.6 Electromagnetic Field Exposure

Because the generator tie-line does not travel through residential areas, and based on recent findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), electromagnetic field (EMF) exposures are not expected to result in a significant impact on public health. The NIEHS report to the U.S. Congress found "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm" (NIEHS, 1999).

3.8.2.7 Summary of Impacts

Results from the air toxics HRA based on emissions modeling indicate there will be no significant incremental public health risks from construction or operation of an auxiliary boiler at SEC. Results from criteria pollutant modeling for routine operations indicate potential ambient concentrations of NO_2, CO, SO_2, $PM_{2.5}$ and PM_{10} will not significantly impact air quality (see Section 3.1). Potential concentrations are below the Federal and California standards established to protect public health, including sensitive members of the population.

3.8.3 Cumulative Impacts

The HRA for the equipment modification indicates the maximum cancer risk resulting from operation of the auxiliary boiler will be approximately 6.71×10^{-6} and the cumulative risk with simultaneous operation of the SEC combustion turbine and the auxiliary boiler will be approximately 6.73×10^{-6}, versus the FRAQMD significance threshold of >10 in one million at the point of maximum exposure to air toxics from power plant emissions utilizing T-BACT. This risk level is considered to be insignificant. Non-cancer chronic and acute effects will also be less than significant. A broader cumulative risk impact analysis is not proposed at this time because of the following:

- Low project operational emissions levels of air toxic substances.
- Insignificant risk resulting from project operations.
- Lack of an established background or baseline risk value for the SEC impact area. The toxics monitoring data compiled by ARB is designed to provide air quality data in support of general population exposures. The data do not provide information on localized impacts, often referred to as near-source or neighborhood exposures.
- The ARB toxics air contaminant monitoring network does not include any monitoring sites within the project impact region, i.e., the sites currently operating in the most recent 3 to 5 period are confined to the major urban areas. The closest monitoring sites would be those located in the Sacramento urban area. These sites would not represent ambient concentrations of toxic substances in remote rural/agricultural areas, such as the SEC site.

3.8.4 Mitigation Measures

3.8.4.1 Criteria Pollutants

Emissions of criteria pollutants will be minimized by applying BACT. BACT for the auxiliary boiler is delineated in Section 3.1. The SEC is located in an area designated by the federal air agencies as unclassified/attainment for ozone, nonattainment for $PM_{2.5}$, and unclassified for PM_{10}. Pursuant to the FRAQMD New Source Review (NSR) Rule, offsets for the net emissions increases of PM_{10}, NOx, and VOC are required for the addition of the auxiliary boiler. Additional mitigation of emissions beyond this is not required specifically for public health.

3.8.4.2 Toxic Pollutants

Emissions of toxic pollutants to the air will be minimized through the use of T-BACT. T-BACT for the auxiliary boiler will be same technologies used for BACT for the criteria pollutants.

3.8.4.3 Hazardous Materials

Mitigation measures for hazardous materials are presented below and discussed in more detail in the Hazardous Materials section. Potential public health impacts from the use of hazardous materials are only expected to occur as a result of an accidental release. The plant has many safety features designed to prevent and minimize impacts from the use and accidental release of hazardous materials. The SEC site already includes the following design features:

- Curbs, berms, and/or secondary containment structures will be provided where accidental release of chemicals may occur.
- A fire-protection system will be included to detect, alarm, and suppress a fire, in accordance with applicable LORS.
- Construction of all storage systems will be in accordance with applicable construction standards and LORS.
- A safety program is currently implemented and will continue to include safety training programs for contractors and operations personnel, including instructions on: (1) the proper use of personal protective equipment (PPE), (2) safety operating procedures, (3) fire safety, and (4) emergency response actions. The safety program will continue to include programs on safely operating and maintaining systems that use hazardous materials. Emergency procedures for personnel include power plant evacuation, hazardous material spill cleanup, fire prevention, and emergency action plan
- Areas subject to potential leaks of hazardous materials have been paved and bermed. Incompatible materials are currently stored in separate containment areas. Also, piping and tanks exposed to potential traffic hazards are currently protected by traffic barriers.
- The facility currently has a compliant Proposition 65 program, and will continue to comply with all signage, notification, and reporting requirements per the statutory requirements during construction and operation of SEC.

3.8.5 References

California Air Resources Board (ARB). 2012. Consolidated table of OEHHA/ARB approved risk assessment health values. (http://arbis.arb.ca.gov/toxics/healthval/contable.pdf).

HARP Express User Manual. Dillingham Software Engineering, Inc., Version 2.07, September 2004.

HARP User Guide, Version 1.4f (2012). CalEPA-Air Resources Board, December 2003.

Hutt, P.B. 1985. Use of quantitative risk assessment in regulatory decision making under federal health and safety statutes, in Risk Quantitation and Regulatory Policy. Eds. D.G. Hoel, R.A. Merrill and F.P. Perera. Banbury Report 19, Cold Springs Harbor Laboratory.

National Institute of Environmental Health Sciences (NIEHS). 1999. Environmental Health Institute report concludes evidence is ‘weak’ that EMFs cause cancer. Press release. National Institute of Environmental Health Sciences, National Institutes of Health.

OEHHA/ARB. 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, CalEPA, August 2003. HARP Model, Version 1.4f, Updated 2012.

Risk Science Associates, Inc. (RSA). 2008. Liberty Energy XXIII-Renewable Energy Power Plant Project, Draft EIR, Public Health Section D.11, Aspen Environmental Group, June 2008.

South Coast Air Quality Management District (SCAQMD). 2005. Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics Hot Spots Information and Assessment Act (AB2588). July 2005.

Travis, C. C., E. A. C. Crouch, R. Wilson and E. D. Klema. 1987. Cancer risk management: A review of 132 federal regulatory cases. *Environ. Sci. Technol.* 21:415-420.

3.8.6 Conditions of Certification

SEC does not request any changes to the conditions of certification for Public Health.

3.9 Socioeconomics

The construction of the auxiliary boiler, ACC expansion, and new generator tie-line and substation will have minor socioeconomic effects. The project site will be located in an unincorporated area of Sutter County and the installation of the new auxiliary boiler and expanded ACC and generator tie-line and substation will have a minor effect on tax distribution. These additions to the facility will contribute construction jobs and revenue to the local economy and will provide net economic benefits. The number of jobs during the operational phase will remain the same, and will not cause a significant net change to the local economy. Finally, SEC's tax rates and capital costs will be larger and this will increase the economic benefits of the project to the local economy.

3.9.1 Environmental Baseline Information

The following subsections describe the effects of construction and operation that will take place as a result of construction of the auxiliary boiler, ACC expansion, and new generator tie-line and substation.

3.9.1.1 Construction Phase Impact

Construction Workforce

Construction of the auxiliary boiler and generator tie-line will take place over approximately 9 months. Table 3.9-1 identifies the construction workforce for the proposed project modifications. Construction personnel requirements will peak at approximately 120 workers in month 8 of the construction period. Construction of the generator tie-line and substation may or may not take place simultaneously. It is shown here as taking place at the same time in order to estimate the worst case for construction traffic.

It is also anticipated that certain major maintenance will occur simultaneously with the upgrades.

TABLE 3.9-1
Construction Workforce by Month

	Number of Craft/Month								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Civil work for ACC	8	8							
ACC			12	25	38	38	30	30	
Steam blows and ACC commissioning									6
Auxiliary boiler foundation		4	2						
Mechanical tie-ins for auxiliary boiler installation				6	6	4			
Auxiliary boiler installation							8	9	
Major Maintenance Staff							56	59	
Generator Tie-line						18	18	18	
Construction Management Staff	1	1	1	1	1	1	1	1	1
Technical Advisor		1	1	1	1	2	3	3	2
Total Craft	**9**	**14**	**16**	**33**	**46**	**63**	**116**	**120**	**9**

Available skilled labor in the Yuba City Metropolitan Statistical Area (MSA)[3] was evaluated by contacting the Building and Construction Trades Department (Table 3.9-2) and surveying California Employment Development Department (CEDD; Table 3.9-3). Both sources show that the workforce in the Yuba City MSA will be adequate to fulfill SEC's minimal construction labor requirements. Therefore, the project will not place an undue burden on the local workforce.

TABLE 3.9-2
Labor Union Contacts in Sutter County

Labor Union	Contact	Phone Number
Mid-Valley B.C.T.C.	Ed Ritchie, Secretary/Treasurer	(530) 743-7321
Construction and General Laborers Local 185	Sarah Hastings, Council Representative	(530) 674-4707

Source: Hastings, 2013 and Ritchie, 2013

TABLE 3.9-3
Available Labor by Skill in Yuba City Metropolitan Statistical Area, 2008–2018

Occupational Title	Annual Averages		Absolute Change	Percentage Change
	2008	2018		
Supervisors, Construction and Extraction Workers	240	250	10	4.2
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	240	250	10	4.2
Construction Trade Workers	1830	1820	-10	-.05
Carpenters	300	320	20	6.7
Cement Masons and Concrete Finishers	90	90	0	0
Construction Laborers	370	380	10	2.7
Operating Engineers and Other Construction Equipment Operators	170	170	0	0
Electricians	120	120	0	0
Painters, Construction, and Maintenance	130	120	-10	-7.7
Plumbers, Pipefitters, and Steamfitters	240	250	10	4.2
Roofers	70	60	-10	-14.3
Sheet Metal Workers	30	30	0	0
Helpers, Construction Trades	70	70	0	0
Helpers – Pipelayers, Plumbers, Pipefitters, and Steamfitters	40	40	0	0
Other Construction and Related Workers	120	130	10	8.3
Construction and Building Inspectors	40	40	0	0

Source: CEDD, 2013

[3] Sutter County combined with Yuba County is part of the Yuba City MSA.

Fiscal Resources

The total construction cost of the project is estimated to be approximately $136 million, of which $23.8 million will be paid out as wages and salaries, including benefits (estimated using an average of $77.10 hour). Local products subject to county taxes will be purchased during the construction process. Local governments will not realize property tax revenue, which reflects the value of the completed facility, until after construction is complete. Sales tax revenue will be realized, however, when the construction period begins. Approximately $13.6 million of total local product purchases would be taxed during project construction. The sales tax rate in Sutter County is 7.25 percent (as of January 2013). The total tax revenue from the sale of local products would be approximately $1,020,000.

3.9.1.2 Operation Phase Impacts

SEC, with the equipment and interconnection modifications, will not require additional workforce or significantly higher operational costs beyond those discussed in the AFC.

3.9.2 Environmental Consequences

No significant impacts to socioeconomics will result from the approval of this Petition. The project will not cause an influx of a significant number of construction or operation workers into the local area; will not have an adverse effect on employment, housing, schools, medical, tax revenues, and fire and police protection; will result in increased revenue from sales taxes due to construction activities; and will recruit employees and purchase materials within the Sutter County area to the greatest extent possible.

3.9.3 Mitigation Measures

No changes to the mitigation measures included in the Commission Decision are necessary.

3.9.4 Consistency with LORS

The construction and operation of the SEC as amended will conform with all applicable LORS related to socioeconomics as identified in the Appendix A to the Commission Decision.

3.9.5 References

California Employment Development Department (CEDD). 2013. Occupational Employment Projections. Internet site: http://www.labormarketinfo.edd.ca.gov. Accessed January 18, 2013.

Hastings, Sarah. 2013. Personal communication between Sarah Hastings/Local 185 and Sarah Madams/CH2M HILL. January 24, 2013.

Ritchie, Ed. 2013. Email communication between Ed Ritchie/Mid-Valley B.C.T.C. and Sarah Madams/CH2M HILL. January 24, 2013.

3.9.6 Conditions of Certification

SEC does not request changes to the socioeconomics Conditions of Certification.

3.10 Soil and Water Resources

The effects of constructing onsite facilities such as the auxiliary boiler and ACC expansion would not cause impacts beyond those considered in the Commission Decision. Construction of the generator tie-line and substation will result in additional disturbance of soil resources. For this reason, this Petition includes a soil erosion analysis for the construction of the additional facilities. This analysis demonstrates that the project modifications will not result in significant adverse impacts to soils.

3.10.1 Environmental Baseline Information

Soil resources associated with the SEC project site and its surroundings were described in the AFC. The construction of the generator tie-line and substation will result in additional disturbance to these soils. The proposed substation is located on land that is currently used for irrigated agriculture, specifically rice production. The proposed underground generator tie-line will run along agricultural access roads. Surrounding land use is primarily agricultural, with the exception of SEC and the adjacent cogeneration power plant facility. The nearest water feature that could potentially be affected by runoff from the project is the Sutter Bypass, located approximately 0.4 mile from the proposed substation.

3.10.1.1 FEMA Flood Zones

SEC, the substation, and generator tie-line route and much of the surrounding areas are located within the Federal Emergency Management Agency (FEMA) Flood Zone A, also referred to as the 100-year flood zone. Construction of new above-ground structures such as the new PG&E substation and CCFC transformers, may require revisions to the Floodplain Insurance Rate Map, and will likely require mitigation or project design measures such as berming or raising certain equipment to a level above the 100-year floodplain to meet building code standards.

3.10.1.2 Soil Mapping Units

Soils in the proposed project area were evaluated using the online Soil Survey of Sutter County, California (Natural Resources Conservation Service [NRCS], 2009). Descriptions of the soil mapping units were developed from the soil survey and the online soil series descriptions (Soil Survey Staff, 2013). Table 3.10-1 describes the properties of the soil mapping units that are found in the vicinity of the project site. Figure 3.10-1 is a map showing the locations of the soil units along the generator tie-line route.

As indicated, the soil mapping units in the project area are primarily fine-textured soils formed in alluvium. These soils are moderately well to well drained and have moderately slow to slow permeability. The soils have a high shrink-swell potential.

As shown on Figure 3.10-1, the proposed substation site lies entirely within soil map unit 153, Oswald clay. The proposed generator tie-line will pass through soil map units 132-Gridley clay loam, 153-Oswald clay, and 174-Tisdale clay loam.

TABLE 3.10-1
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description	
132	Gridley clay loam, 0 to 1 percent slopes:	
	A portion of the generator tie-line traverses this soil unit.	
	Formation:	In alluvium from mixed sources
	Typical profile:	Clay loam over clay
	Shrink-swell capacity:	High
	Depth and drainage:	Moderately deep; moderately well drained
	Permeability:	Slow
	Runoff:	Slow
	Capability class:	3s (irrigated), 4s (non irrigated)
	Taxonomic class	Fine, smectitic, thermic Typic Argixerolls

TABLE 3.10-1
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description	
153	Oswald clay, 0 to 2 percent slopes:	
	The proposed substation and a portion of the generator tie-line traverse this soil unit.	
	Formation:	In alluvium from mixed sources
	Typical profile:	Clay over weathered bedrock
	Shrink-swell capacity:	High
	Depth and drainage:	Moderately deep; moderately well drained
	Permeability:	Slow
	Runoff:	Very slow
	Capability class:	3w (irrigated), 4w (non irrigated)
	Taxonomic class:	Fine, smectitic, thermic Aquic Haploxererts
174	Tisdale clay loam, 0 to 2 percent slopes:	
	A portion of the generator tie-line traverses this soil unit.	
	Formation:	In alluvium from mixed sources
	Typical profile:	Clay loam over weathered bedrock
	Shrink-swell capacity:	High
	Depth and drainage:	Moderately deep; well drained
	Permeability:	Moderately slow
	Runoff:	Very slow
	Capability class:	3s (irrigated), 4s (non irrigated)
	Taxonomic class:	Fine-loamy, mixed, superactive, thermic Typic Haploxerolls

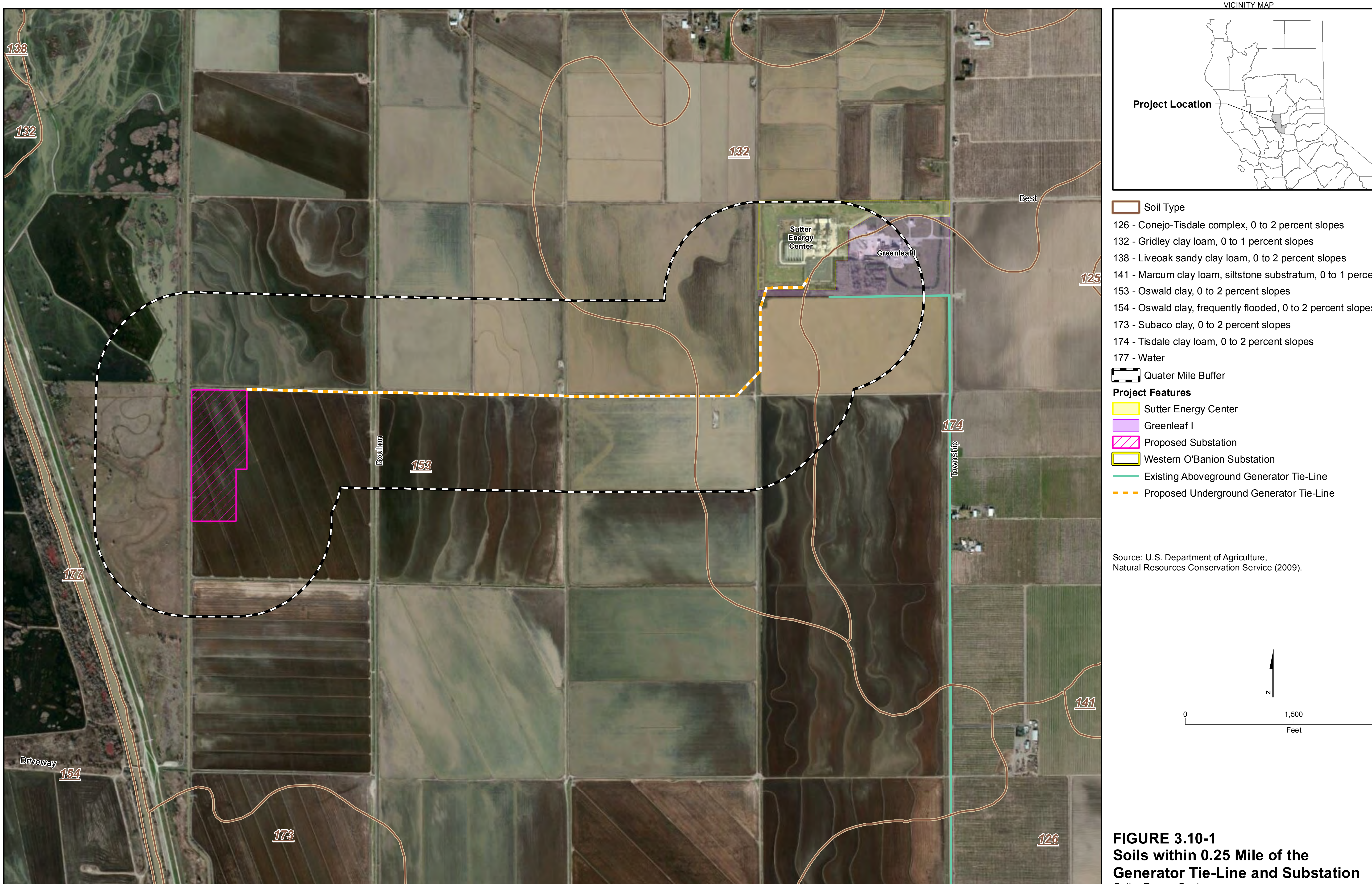
Soil characteristics are based on soil mapping descriptions provided in the online soil survey reports (http://soildatamart.nrcs.usda.gov/) [NRCS, 2009] and Official Soil Series Descriptions (http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi) [Soil Survey Staff, 2013]. Soil descriptions provided above are limited to those soil units that could be directly affected by the VEC. Other soil mapping units, which are well outside of the project area but are shown on Figure 3.10-1 include 112-Clear Lake clay; 124-Conejo loam; 125-Conejo loam, siltstone substratum; 126-Conejo-Tisdale complex; 131-Garretson variant loam; 138-Liveoak sandy clay loam; 141-Marcum clay loam; 154-Oswald clay, frequently flooded; 161-Shanghai fine sandy loam; 173-Subaco clay; and 177-Water.

3.10.1.3 Potential for Soil Loss and Erosion

The factors that have the largest effect on soil loss include steep slopes, lack of vegetation, and erodible soils composed of large proportions of silts and fine sands. The soils found in the project area are nearly level, with an estimated average slope of less than 1 percent.

Soils in the project area are fine in texture, ranging from clay loam to clay (NRCS, 2009). The erosion potential of these soils will vary, based upon the wetness of the soil, soil compaction, sizes of soil particles, and other site-specific properties. The soils in the project area are expected to have relatively high water erosion potential and a low wind erosion potential for the following reasons:

- There are nearly level conditions at the proposed substation and generator tie-line sites; however, the soil units are expected to have moderately slow to slow permeability (and consequently, the potential for high runoff). Runoff will mainly be a concern where soil is stockpiled during the construction of the generator tie-line trench.
- The clay loam and clay surface materials are not expected to be readily transported by wind. It is expected that any laydown areas will be covered (by gravel or paving) immediately after grading to prevent subsequent wind erosion losses.



Soil Type

126 - Conejo-Tisdale complex, 0 to 2 percent slopes

132 - Gridley clay loam, 0 to 1 percent slopes

138 - Liveoak sandy clay loam, 0 to 2 percent slopes

141 - Marcum clay loam, siltstone substratum, 0 to 1 percent slopes

153 - Oswald clay, 0 to 2 percent slopes

154 - Oswald clay, frequently flooded, 0 to 2 percent slopes

173 - Subaco clay, 0 to 2 percent slopes

174 - Tisdale clay loam, 0 to 2 percent slopes

177 - Water

Quater Mile Buffer

Project Features

Sutter Energy Center

Greenleaf I

Proposed Substation

Western O'Banion Substation

Existing Aboveground Generator Tie-Line

Proposed Underground Generator Tie-Line

Source: U.S. Department of Agriculture, Natural Resources Conservation Service (2009).

N

0 1,500 3,000

Feet

FIGURE 3.10-1
Soils within 0.25 Mile of the Generator Tie-Line and Substation
Sutter Energy Center

CH2MHILL

Due to the clayey nature of the soils, it is anticipated that the generator tie-line trench will be over-excavated and replaced with fill. Excavation of soil will create large, structureless soil stockpiles that will be susceptible to erosion because of the increased slope.

Given the potential for expansive native soils in the project area, structures (for example, at the substation) may have to be founded upon imported soils of construction fill. These soils, if exposed, could be subject to higher rates of water and wind erosion than the native soils. If needed, sources of fill will be identified during final construction planning.

3.10.1.4 Other Significant Soil Characteristics

As mentioned previously, the soil units on which the proposed substation and generator tie-line will be built have a high shrink-swell capacity. The presence of expansive clays in the soil may affect the suitability of the soil as a bearing surface for the substation foundation and generator tie-line because they have the potential to heave or collapse with changing moisture content. A geotechnical evaluation will be performed as part of the preconstruction design to account for the native soil conditions, and geotechnical recommendations will be followed during construction.

A significant soil feature for map unit 153 is its aquic moisture regime, which indicates that the map unit is commonly saturated with water. The moisture regime is independent of land use; that is, the soil would experience saturation even if not used in rice production. Soil saturation may present a problem during the construction and operation of the proposed facilities, and should be considered during the geotechnical investigation and subsequent design of the facilities.

3.10.2 Environmental Consequences

It is anticipated that the environmental consequences, and therefore mitigation measures, identified in the original AFC will remain the same. The types of impacts associated with the generator tie-line construction would be similar to those described in the AFC for SEC's natural gas pipeline.

3.10.2.1 Soil Erosion during Construction

Construction impacts on soil resources can include increased soil erosion and soil compaction. Soil erosion causes the loss of topsoil and can increase the sediment load in surface receiving waters downstream of the construction site. The magnitude, extent, and duration of construction-related impact depends on the erodibility of the soil; the proximity of the construction activity to the receiving water; and the construction methods, duration, and season.

Because conditions that could lead to soil erosion are not present, little soil erosion is expected during the construction period. In addition, best management practices (BMP) will be implemented during construction in accordance with the site-specific Stormwater Pollution Prevention Plan (SWPPP) required for compliance with the Industrial General Permit (IGP). The Construction General Permit (CGP) also requires inspections to ensure that the BMPs described in the SWPPP are properly implemented and effective.

The CEC also requires that project owners develop and implement an Erosion Control Plan (ECP) to reduce the impact of runoff, erosion, and sediment transport from the construction site. Because of inherently low soil erodibility and based on compliance with applicable stormwater regulations during construction and operation of the project, impacts from soil erosion are expected to be less than significant. Estimates of erosion by water and wind are provided in the following sections.

Water Erosion

An estimate of soil loss during construction by water erosion is found in Table 3.10-2. This estimate was developed using the Revised Universal Soil Loss Equation (RUSLE2) program using the following assumptions. Detailed calculations and assumptions for the soil loss estimates are found in Appendix 3.10A.

- The proposed substation area is approximately 28 acres. Active soil filling and grading will occur over a 1-month period. The soil in this area will then be exposed for an additional 6-month construction period, after which the majority of the site will be paved, graveled or otherwise covered with the new substation. It is assumed that approximately 10 percent of the proposed substation area will have bare soil exposure during the construction period.

- The area of the new auxiliary boiler, ACC, and perimeter road expansion is approximately 0.79 acres. Active soil grading will occur over a 1-month period, with an additional 12 month construction period. It is assumed that approximately 10 percent of the facilities area will have bare soil exposure during the construction. It is assumed that the perimeter road will be paved or graveled (and therefore protected) after completion of grading.
- The generator tie-line will be constructed within a 60 foot right-of-way. The tie-line will be installed underground, in an 8-foot wide trench. Approximately 50 percent of the construction corridor will be exposed during construction (including the trench).
- Estimates of soil loss (in tons) were made for the site-specific soil mapping unit characteristics within the RUSLE2 database.
- Site-specific RUSLE2 rainfall erosivity conditions were estimated using the online National Weather Service data (NOAA Atlas 2) at http://hdsc.nws.noaa.gov/hdsc/pfds/
- A 100-foot slope length was assumed for all soil units. The median of each soil unit slope class was used for the RUSLE calculations.

TABLE 3.10-2
Construction Soil Loss Estimates Using the Revised Universal Soil Loss Equation[a]

Feature (acreage)[b]	Activity	Duration (months)	Soil Loss (tons) without BMPs	Soil Loss (tons) with BMPs	Soil Loss (tons/year) No Project
Substation (28 acres)	Filling/grading	1	3.03	0.004	0.50
	Construction	12	1.76	0.05	—
New Aux Boiler, ACC, and Perimeter Rd Expansion (0.79 acres)	Grading	1	0.07	0.0001	0.01
	Construction	12	0.03	0.001	_
Generator Tie-line (1.8 acres for the trench; 13.7 acres for the construction corridor)	Excavation/grading	4	0.77	0.04	0.23
	Construction	2	0.68	0.02	—
Project Soil Loss Estimates		**13**	**6.34**	**0.11**	**0.74**

[a] Soil losses (tons/acre/year) are estimated using RUSLE2 software available online [http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_index.htm].
[b] Acreages assume 60-foot construction corridor for the generator tie-line. The generator tie-line trench was assumed to be 7.5 feet wide.

Soil losses are estimated using the following RUSLE2 conditions:

- **Construction** soil losses were approximated using Management as “bare ground, smooth surface;” Contouring: Rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.
- **Active grading** soil losses were approximated using Management as “bare ground, rough surface” soil conditions; Contouring: Rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.
- **Construction soil losses with implementation of construction BMPs** was approximated using Management as “Silt fence”; Contouring: Perfect, no row grade; Diversion/terracing: None; and Strips and Barriers: two silt fences, one at end of RUSLE2 slope.
- A **“No Project”** soil loss estimate was also approximated using Management as “Dense grass – not harvested”; Contouring: Rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.

With the implementation of appropriate BMPs that will be required under the CGP, and as described in the original AFC, the total project soil loss of 0.11 ton is considered to be a minimal amount and would not constitute a significant impact. It also should be recognized that the estimate of accelerated soil loss by water is very conservative (overestimate of soil loss) because it assumes only a single BMP (that is, silt fencing), whereas a SWPPP will require an effective combination of erosion and sediment control measures.

Wind Erosion

The potential for wind erosion of surface material was estimated by calculating the total suspended particulates (TSP) that could be emitted as a result of grading and the wind erosion of exposed soil. The total site area and grading duration were multiplied by emission factors to estimate the TSP matter emitted from the site. Fugitive dust from site grading was calculated using the default particulate matter less than 10 microns in equivalent diameter (PM_{10}) emission factor used in URBEMIS2002 (Jones and Stokes Associates, 2003) and the ratio of fugitive TSP to PM_{10} published by the Bay Area Air Quality Management District (BAAQMD, 2005). Fugitive dust resulting from the wind erosion of exposed soil was calculated using the emission factor in AP-42 (U.S. Environmental Protection Agency, 1995; also in Table 11.9-4 in BAAQMD, 2005).

Table 3.10-3 summarizes the TSP predicted to be emitted from the site from grading and the wind erosion of exposed soil. Without mitigation, the maximum predicted erosion of material from the project area is estimated at 2.2 tons over the course of the project construction cycle. This estimate is reduced to approximately 0.78 tons by implementing basic mitigation measures such as water application (see original AFC for mitigation measures). These estimates are conservative because they make use of emission rates for a generalized soil rather than site-specific soil properties. With the implementation of mitigation measures described in the original AFC, impacts related to soil erosion from wind will be less than significant.

TABLE 3.10-3
Soil Loss from Grading and Wind Erosion

Emission Source	Acreage	Duration (months)	Unmitigated TSP (tons)	Mitigated TSP (tons)
Grading/Filling Dust:				
Substation	28	1	0.48	0.17
Aux Boiler, ACC, and Perimeter Road Expansion	0.8	1	0.014	0.005
Generator Tie-line (trench)	1.8	4	0.13	0.04
Wind Blown Dust:				
Substation	28	12	1.1	0.37
Aux Boiler, ACC, and Perimeter Road Expansion	0.1	12	0.024	0.008
Generator Tie-line Corridor	6.9	2	0.44	0.15
Estimated Total			**2.1**	**0.75**

3.10.3 Mitigation Measures

BMPs in accordance with the SWPPP and ECP will be used to minimize erosion during construction. These erosion-control measures would be required to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation that destroys soil productivity and soil capacity. Typically, these measures include mulching, physical stabilization, dust suppression, berms, ditches, and sediment barriers. Water erosion will be mitigated through the use of sediment barriers, and wind erosion potential will be reduced significantly by keeping soil moist and by covering and/or hydro-seeding soil stockpiles. Upon completion of construction activities, land surfaces will be permanently stabilized. The substation site will be covered with structures or pervious ground cover (for example, gravel or landscape), and the area where construction of the generator tie-line trench occurred will be restored to its preconstruction land use. Therefore, soil erosion losses after construction are expected to be negligible.

3.10.3.1 Temporary Erosion Control Measures

BMPs will be implemented during construction in accordance with the SWPPP required by the State's GCP for all construction projects over 1 acre in size. Additionally, the CEC requires that project owners develop and implement an ECP to reduce the impact of runoff from the construction site.

Temporary erosion control measures required for the SWPPP and ECP would be implemented before construction begins, and would be evaluated and maintained during construction. These measures typically include but are not limited to revegetation, mulching, physical stabilization, dust suppression, berms, ditches, and sediment barriers. These measures would be removed from the site after the completion of construction.

During construction of the project, dust erosion control measures would be implemented to minimize the wind-blown loss of soil from the site. Water of a quality equal to or better than existing surface runoff would be sprayed on the soil in construction areas to control dust prior to completion of permanent control measures.

Sediment barriers, which slow runoff and trap sediment, would be incorporated as discussed below. Sediment barriers include straw bales, sand bags, straw wattles, and silt fences. They are generally placed below disturbed areas, at the base of exposed slopes, and along streets and property lines below the disturbed area. Sediment barriers are often placed around sensitive areas to prevent contamination by sediment-laden water near areas such as wetlands, creeks, or storm drains. Such barriers would be placed upgradient to prevent sediment from discharging into these sensitive areas.

The site will be constructed on relatively level ground; therefore, it is not considered necessary to place sediment barriers around the entire property boundary. However, some barriers would be placed in locations where offsite drainage could occur to prevent sediment from leaving the site (such as downgradient of the soil stockpiles). If used, sediment barriers would be properly installed (e.g., staked and keyed), then removed or used as mulch after construction. Runoff detention basins, drainage diversions, and other large-scale sediment traps are not considered necessary because of the site's small size, level topography, and surrounding paved areas. Sediment barriers would be installed around the base of the soil stockpiles, and stockpiles would be stabilized and covered.

Mitigation measures, such as watering exposed surfaces, are used to reduce PM_{10} emissions during construction activities. The PM_{10} reduction efficiencies are taken from the SCAQMD CEQA Handbook (1993) and were used to estimate the effectiveness of the mitigation measures. Table 3.10-4 summarizes the mitigation measures and PM_{10} reduction efficiencies.

TABLE 3.10-4
Mitigation Measures for Fugitive Dust Emissions

Mitigation Measure	PM_{10} Emission Reduction Efficiency (%)
Water active sites at least twice daily	34–68
Enclose, cover, water twice daily, or apply non-toxic soil binders, according to manufacturer's specifications, to exposed piles (that is, gravel, sand, dirt) with 5 percent or greater silt content	30–74

Source: SCAQMD CEQA Handbook, Table 11-4 (1993)

3.10.3.2 Permanent Erosion Control Measures

Permanent erosion-control measures on the site will include gravel at the substation, and return of the generator tie-line trench to its preconstruction state (currently field boundaries and agricultural access roads).

3.10.3.3 Geotechnical Soil Investigation

As part of pre-construction engineering, a geotechnical soil investigation will be performed to evaluate the engineering characteristics of project site soils and determine remedial measures to address impacts related to soil properties. Recommendations provided in the geotechnical report will be followed to mitigate potential impacts related to soil texture and expansiveness.

No significant impacts in terms of soil and water will result from the approval of this Petition. Therefore, mitigation measures beyond those in the Commission Decision are not necessary.

3.10.4 Consistency with LORS

The construction and operation of SEC, as amended, will conform with all applicable LORS related to soil and water resources.

3.10.5 References Cited

Bay Area Air Quality Management District (BAAQMD). 2005. *Permit Handbook*. Available at http://hank.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm Verified January 9, 2013.

Jones and Stokes Associates. 2003. *Software User's Guide: URBEMIS-2002 for Windows with Enhanced Construction Module, Version 7.4*.

Natural Resources Conservation Service (NRCS). 2009. Soil Survey Geographic (SSURGO) database for Sutter County, California (Online). Available at http://soildatamart.nrcs.usda.gov. Accessed January 4, 2013.

Soil Survey Staff. 2013. Official Soil Series Descriptions (Online). Available at http://soils.usda.gov/technical/classification/osd/index.html (accessed January 7, 2013).

South Coast Air Quality Management District (SCAQMD). 1993. *CEQA Air Quality Handbook*. Diamond Bar, California.

U.S. Environmental Protection Agency. 1995. *Compilation of Air Pollutant Emission Factors AP 42. Volume I: Stationary Point and Area Sources*, 5th edition (Online). Available at http://www.epa.gov/ttn/chief/ap42/index.html. Verified January 9, 2013.

3.10.6 Conditions of Certification

SEC does not request changes to the soil and water resources Conditions of Certification.

3.11 Traffic and Transportation

Project construction will not involve substantial changes to the traffic and transportation findings and conclusions of the Commission Decision. While traffic volumes in the region have increased since the preparation of the AFC, the surrounding roadways continue to operate at acceptable levels of service (LOS) and could accommodate the project related construction traffic. The roadways will still be well within Sutter County's range of acceptable operations.

The following section provides a summary of the existing traffic conditions (updated environmental baseline information), describes the anticipated construction project trip generation and distribution, and analyzes the potential traffic impacts of the project.

3.11.1 Environmental Baseline Information

Section 8.10, Traffic and Transportation, of the AFC was reviewed and the environmental baseline information was updated to reflect the existing traffic conditions in the study area. This update is based on traffic data contained in the *Sutter County General Plan Draft Environmental Impact Report*, Chapter 6.14 (September 2010) and the *Sutter County General Plan Technical Background Report*, Chapter 3 (February 2008). This information is incorporated by reference.

3.11.1.1 Surrounding Roadway Network

No major changes to the transportation infrastructure have occurred near the project site since the preparation of the AFC, other than minor realignments and additional lanes to the major north-south artery in this area, state route (SR) 99. The county continues to be primarily served by a system of rural roadways. SR 20, SR 70, SR 99, and SR 113 are the primary regional transportation corridors within the county. SR 20 serves east-west regional travel providing connection to Yuba County and beyond to the east, and Colusa County and beyond to the west. SR 70, SR 99, and SR 113 serve the north-south regional travel corridor providing connection to Butte County and beyond to the north, and Sacramento County to the south. The primary east-west roads near the project site continue to include Oswald Road, Pierce Road, Best Road, O'Banion Road, and Tudor Road (SR 113). Oswald Road (to the north) and O'Banion Road and Tudor Road (to the south) provide access to SR 99 to the east. The primary north-south roads in the project area continue to include George Washington Boulevard and South Township Road. The existing road network is presented in Figure 3.11-1.

As identified in the project license, truck deliveries will access the site using one of two routes, utilizing Highway 99 or Highway 20. From highway 99, trucks will exit on Oswald Road heading west and then turn south on South Township Road to the site. Truck deliveries using Highway 20 will access the site by exiting south on George Washington Blvd, then turning west on Oswald Road and south on South Township Road to the site. Oversized equipment delivered by rail will use the following route to the project site: Clark Road west to Broadway, south on Broadway to Nuestro Road, west on Nuestro Road to North Township, south on North Township to the SPP site. These routes are identified in Figure 3.11-1.

3.11.1.2 Traffic Impact Thresholds

To identify the operating condition at roadways and intersections, the LOS ranking scale from the *Highway Capacity Manual* (HCM) is used. LOS is a quantitative measure describing operational conditions within a traffic stream and generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions and comfort and convenience. Six levels of service are defined and given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Table 3.11-1 presents the characteristics associated with each LOS grade.

TABLE 3.11-1
Level of Service Definitions

LOS	Traffic Flow Characteristics
A	Free flow; insignificant delays
B	Stable operation; minimal delays
C	Stable operation; acceptable delays
D	Approaching unstable flow; queues develop rapidly but no excessive delays
E	Unstable operation; significant delays
F	Forced flow; jammed conditions

As part of the update to the General Plan, Sutter County modified its policy on LOS. Previously the County considered LOS D as the minimum acceptable standard for its roadways. The County's new policy is to:

> …develop and manage the County roadway segments and intersections to maintain LOS D or better during peak hour, and LOS C or better at all other times and to adjust for seasonality. These standards shall apply to all County roadway segments and intersections, unless otherwise addressed in an adopted specific plan or community plan. (Sutter County, 2010)

Caltrans has adopted LOS E as the minimum acceptable standard for SR 99 and LOS D as the minimum acceptable standard for SR 113.

Table 3.11-2 lists the County's LOS thresholds and capacities by roadway facility.

TABLE 3.11-2
Roadway Level of Service Thresholds

Roadway Type	LOS C	LOS D	LOS E
Rural – Two Lane	7,000–10,600	10,600–16,400	16,400–25,200
Urban – Three Lane	15,330–17,520	17,520–19,700	19,700–21,900
Urban – Five Lane	30,660–35,040	35,040–39,420	39,420–43,800
Expressway – Four Lane	29,100–41,800	41,801–53,500	53,501–59,500
Freeway – Four Lane	33,700–48,400	48,401–60,000	60,001–67,400
Freeway – Six Lane	51,800–73,900	73,901–90,900	90,901–101,800

3.11.1.3 Existing Traffic Conditions

The existing average daily volumes and LOS for the surrounding roadways are presented in Table 3.11-3 and illustrated in Figure 3.11-2. As shown below, the roadways in the project vicinity are under capacity and currently operate at acceptable LOS.

TABLE 3.11-3
Existing Roadway Operating Conditions

Roadway	From	To	Classification	Lanes	Existing ADT	LOS
South Township Road	SR 20	Franklin Road	Urban Collector	3	3,330	A
	Franklin Road	Lincoln Road	Rural Arterial	2	1,530	A
	Lincoln Road	Bogue Road	Rural Arterial	2	1,140	A
	Bogue Road	Oswald Road	Rural Arterial	2	750	A
	Oswald Road	O'Banion Road	Rural Arterial	2	380	A
	O'Banion Road	Tudor Road	Rural Arterial	2	170	A
George Washington Blvd.	SR 20	Franklin Road	Rural Arterial	2	7,420	C
	Franklin Road	Lincoln Road	Rural Collector	2	4,280	B
	Lincoln Road	Bogue Road	Rural Collector	2	3,390	B
	Bogue Road	Oswald Road	Rural Collector	2	3,940	B
	Oswald Road	Tudor Road–SR 113	Rural Collector	2	3,040	A
O’Banion Road*	Boulton Road	Township Road	Rural Arterial	2	155	A
	Township Road	George Washington Blvd	Rural Arterial	2	337	A
Oswald Road	Township Road	George Washington Blvd	Rural Collector	2	590	A
	George Washington Blvd	Walton Avenue	Rural Collector	2	1,360	A
	Walton Avenue	SR 99	Urban Collector	3	2,150	A
Tudor Road (SR 113)	George Washington Blvd.	SR 99	Rural Arterial	2	3,850	B
SR 113	Yolo County Line	Knights Rd.	Rural Arterial	2	7,400	C
	Knights Road	Del Monte Avenue	Rural Arterial	2	7,400	C
	Del Monte Avenue	Sutter Bypass	Rural Arterial	2	5,500	B
	Sutter Bypass	George Washington Blvd.	Rural Arterial	2	5,800	B
	George Washington Blvd.	Junction SR 99	Rural Arterial	2	3,850	B
SR 99	Sacramento County	Riego Road	Expressway	4	39,500	C
	Riego Road	Sankey Road	Expressway	4	33,500	C
	Sankey Road	Howsley Road	Expressway	4	33,500	C
	Howsley Road	SR 70	Expressway	4	33,500	C
	Junction SR 70	Garden Highway	Rural Arterial	2	16,200	D
	Garden Highway	Sacramento Avenue	Rural Arterial	2	17,400	E
	Sacramento Avenue	Tudor Road	Rural Arterial	2	17,600	E
	Tudor Road	Junction SR 113	Rural Arterial	2	14,400	D
	Junction SR 113	O'Banion Road	Rural Arterial	2	17,300	E
	O'Banion Road	Oswald Road	Expressway	4	17,300	A

*Current traffic volumes are not available for O’Banion Road. Assumes a 20% increase in traffic since 1995.
Source: Sutter County, 2010

3.11.2 Environmental Consequences

The impact of the project is measured by the potential change in the traffic operations of surrounding intersections and roadways. Traffic associated with the project after the 12-month construction period is expected to be minimal. Therefore, this assessment focuses on the project traffic under a worst-case peak construction period.

3.11.2.1 Construction Trip Generation

The amount of traffic generated by SEC was estimated based on the anticipated construction schedule, activities, and workforce, including the number of employees and anticipated daily truck activity at the site. The vehicular trips associated with the project were separated into construction worker trips (generally auto trips) and delivery trips (truck trips).

The number of construction workers will fluctuate throughout the 9-month construction period, with the peak construction effort onsite occurring during Month 8, when 102 workers are projected. As a conservative estimate it assumed that none of the construction workers will carpool. Therefore, the construction workforce will generate 204 average daily trips (ADT), 102 AM peak hour trips and 102 PM peak hour trips.

The average number of deliveries per day is estimated to be five. The greatest number of truck deliveries expected during construction of the project in the peak construction month is approximately 40 deliveries or 80 trips per day. It is assumed that the truck trips will be spread evenly throughout the day, beginning at 8:00 AM and ending at 5:00 PM. Also, it was assumed that all inbound deliveries would occur in the first 8 hours, and all exiting delivery truck trips would occur in the last eight hours. The resulting estimate was five trips during the morning peak hour and five trips during the afternoon peak hour.

The project trip generation during the peak construction month is presented in Table 3.11-4. The project-added trips are shown graphically Figure 3.11-3.

TABLE 3.11-4
Construction Project Trip Generation

		AM Peak Hour			PM Peak Hour		
Trip Type	**ADT**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Delivery Trucks	80	5	0	5	0	5	5
Delivery Trucks PCE (1.5)*	120	8	0	8	0	8	8
Workers	240	120	0	120	0	120	120
Total Construction Traffic in PCE	360	128	0	128	0	128	128

*PCE = passenger car equivalent

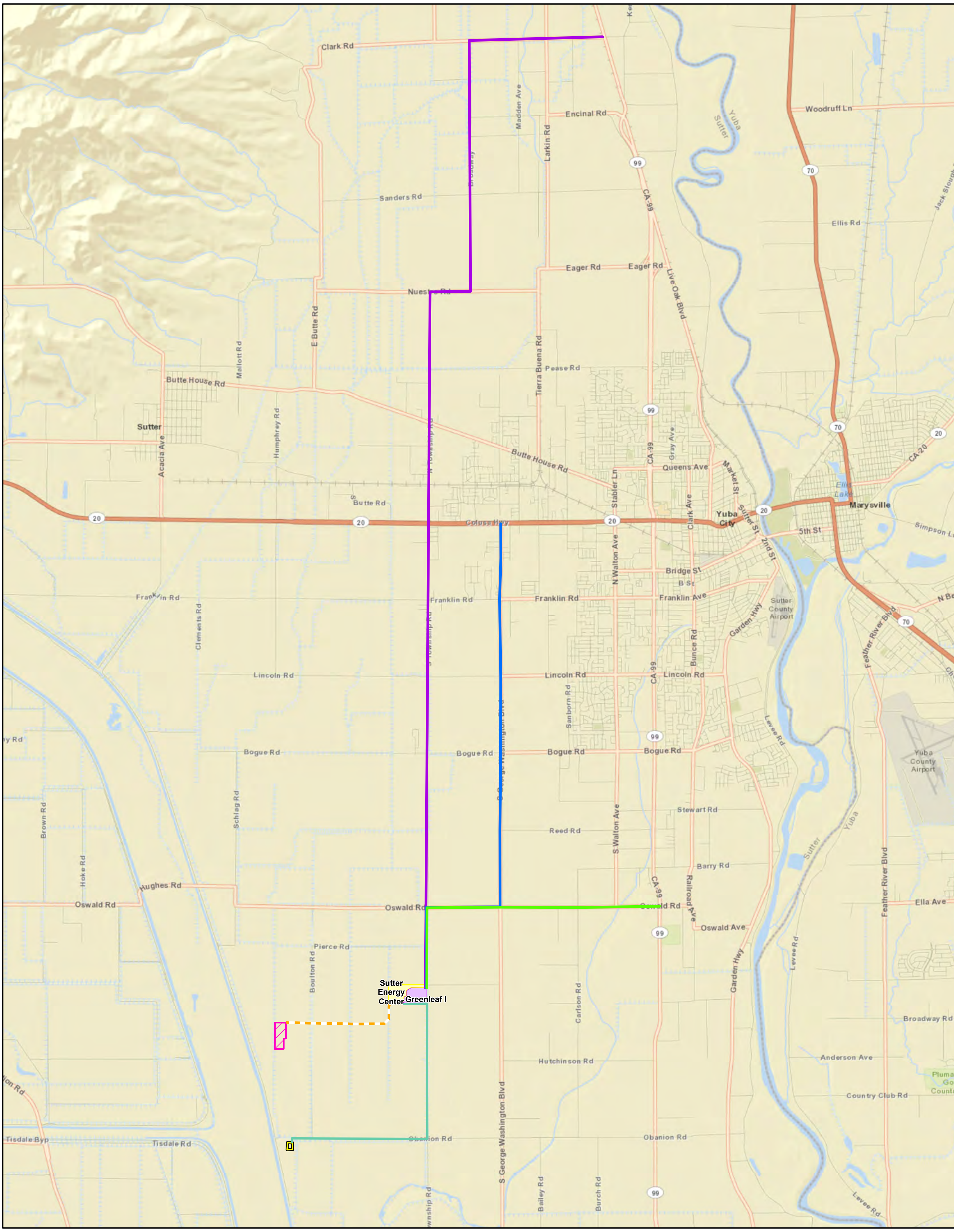
3.11.2.2 Construction Traffic Distribution

Based on the regional street network and anticipated employee origins and destinations, it is anticipated that SEC construction traffic would be distributed as follows:

- 5 percent of the trips would come from surrounding areas to the east/west and north
- 55 percent of the trips would come from the Sacramento region
- 40 percent of the trips would come from the Bay Area

3.11.2.3 Existing Plus Construction Traffic Conditions

Based on the project traffic distribution discussed earlier, the project traffic was added to the existing traffic volumes and the roadway LOS analysis was updated. The existing plus construction-related traffic volumes are resulting roadway LOS are summarized in Table 3.11-5.

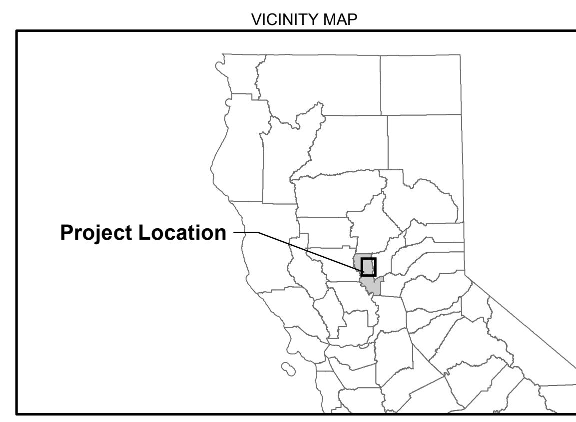


Project Features

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation
- Existing Aboveground Generator Tie-Line
- Proposed Underground Generator Tie-Line
- Rail Delivery Route
- Truck Delivery Route #1
- Truck Delivery Route #2

0 1.25 2.5
Miles

VICINITY MAP



Source: ESRI (2013).

FIGURE 3.11-1
Local Roadway Network
Sutter Energy Center

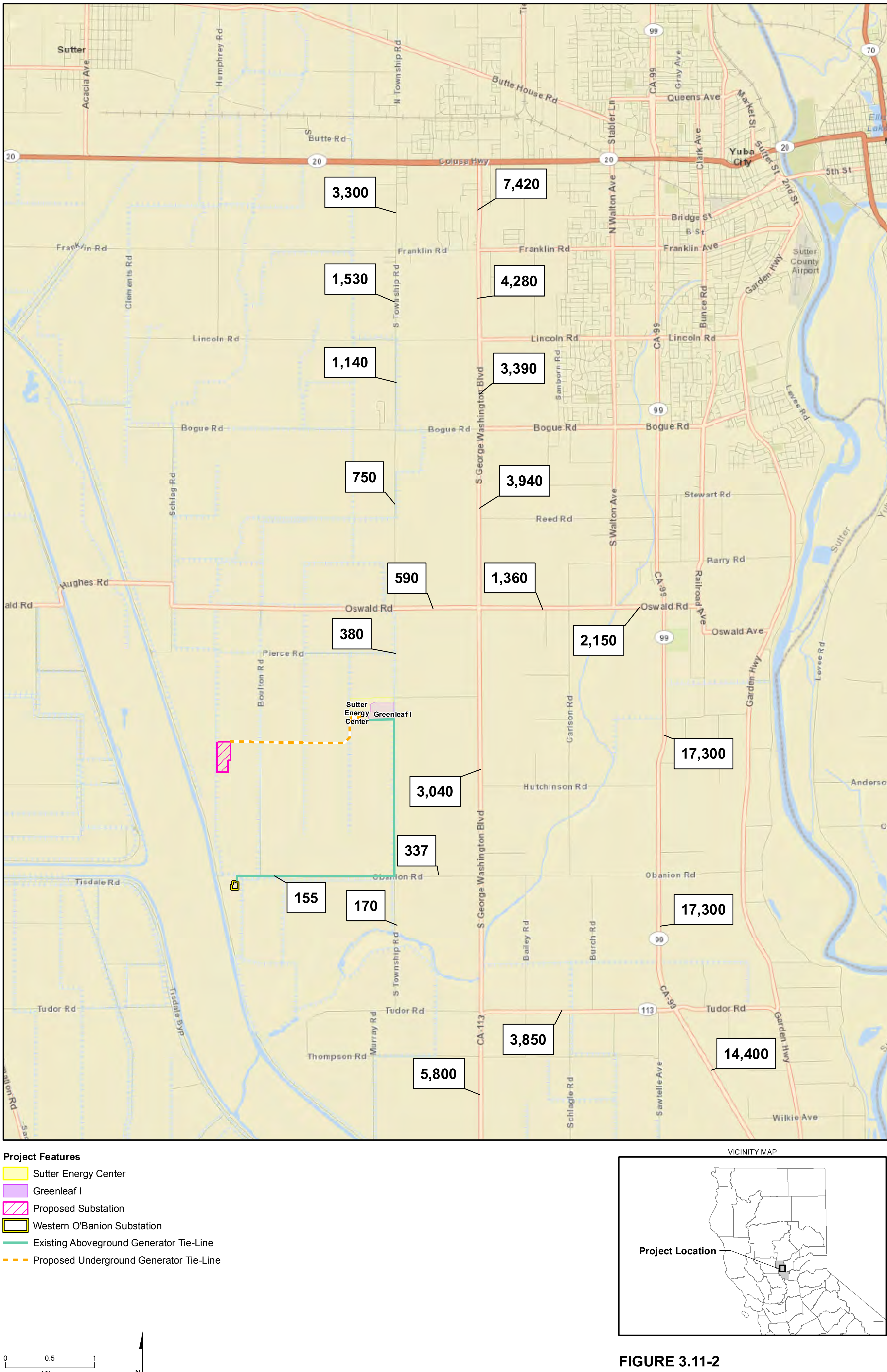
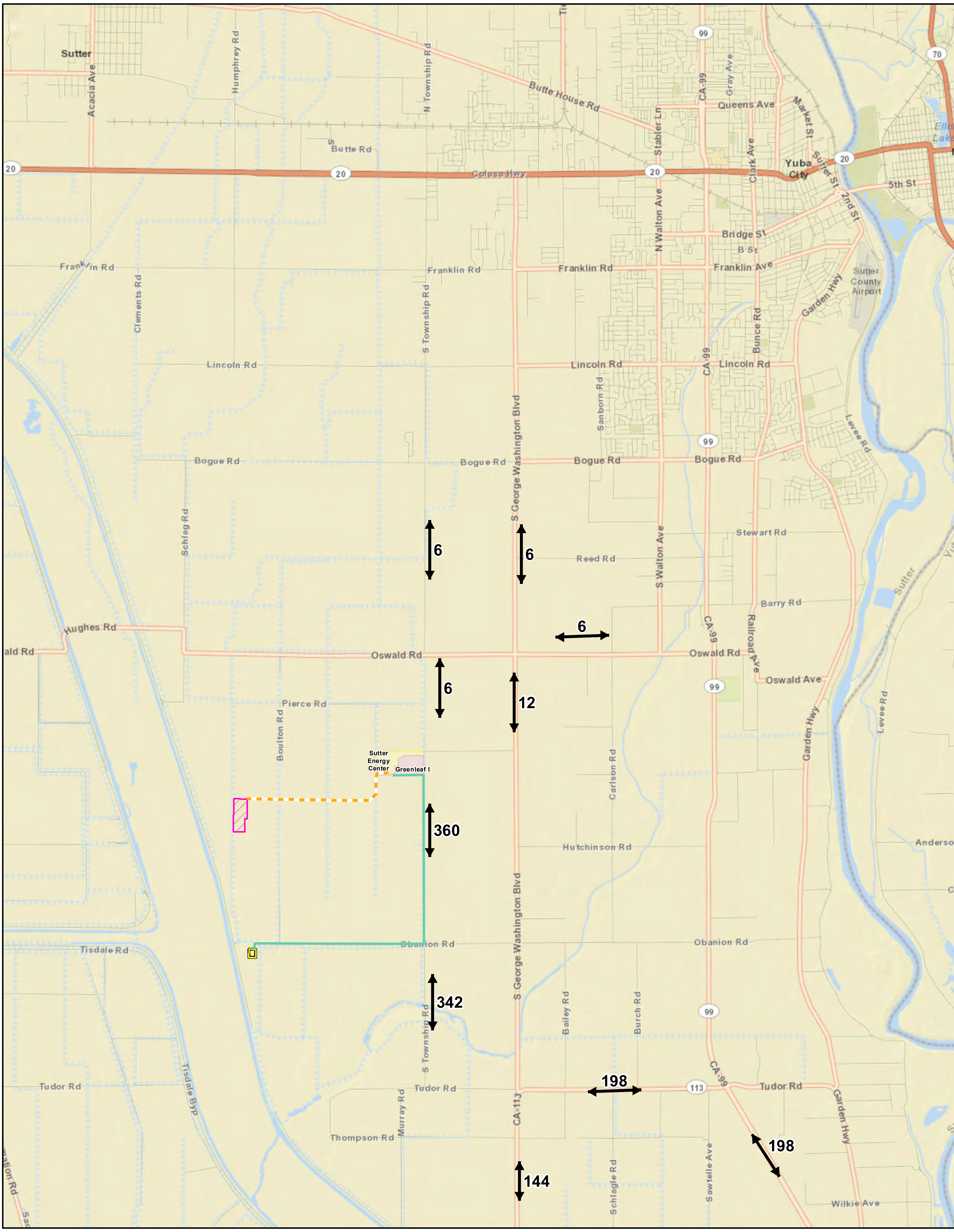


FIGURE 3.11-2
Vehicles Per Day
Sutter Energy Center

Source: ESRI (2013), Sutter County (2007).

CH2MHILL.



Project Features

- Sutter Energy Center
- Greenleaf I
- Proposed Substation
- Western O'Banion Substation
- Existing Aboveground Generator Tie-Line
- Proposed Underground Generator Tie-Line
- X Project-Added Daily Trips

0 0.5 1
Miles

Source: ESRI (2013).

VICINITY MAP

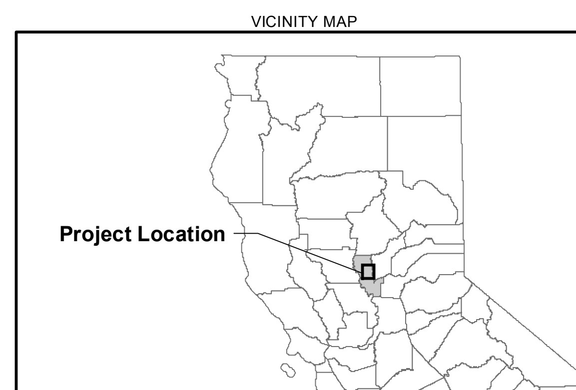


FIGURE 3.11-3
Project-Added Construction Trips
Sutter Energy Center

CH2MHILL

TABLE 3.11-5
Existing Plus Project Roadway Operating Conditions

Roadway	From	To	Classification	Lanes	Existing ADT	Project Trips	Existing + Project ADT	LOS with Project
South Township Road	SR 20	Franklin Road	Urban Collector	3	3,330	6	3,336	A
	Franklin Road	Lincoln Road	Rural Arterial	2	1,530	6	1,536	A
	Lincoln Road	Bogue Road	Rural Arterial	2	1,140	6	1,146	A
	Bogue Road	Oswald Road	Rural Arterial	2	750	6	756	A
	Oswald Road	O'Banion Road	Rural Arterial	2	380	360	740	A
	O'Banion Road	Tudor Road	Rural Arterial	2	170	342	512	A
George Washington Blvd.	SR 20	Franklin Road	Rural Arterial	2	7,420	6	7,426	C
	Franklin Road	Lincoln Road	Rural Collector	2	4,280	6	4,286	B
	Lincoln Road	Bogue Road	Rural Collector	2	3,390	6	3,396	B
	Bogue Road	Oswald Road	Rural Collector	2	3,940	6	3,946	B
	Oswald Road	Tudor Road – SR 113	Rural Collector	2	3,040	12	3,052	A
O'Banion Road*	Boulton Road	Township Road	Rural Arterial	2	155	0	155	A
	Township Road	George Washington Blvd	Rural Arterial	2	337	0	337	A
Oswald Road	Township Road	George Washington Blvd	Rural Collector	2	590	6	596	A
	George Washington Blvd	Walton Avenue	Rural Collector	2	1,360	6	1,366	A
	Walton Avenue	SR 99	Urban Collector	3	2,150	6	2156	A
Tudor Road (SR 113)	George Washington Blvd.	SR 99	Rural Arterial	2	3,850	198	4,048	B
SR 113	Yolo County Line	Knights Rd.	Rural Arterial	2	7,400	144	7,544	C
	Knights Road	Del Monte Avenue	Rural Arterial	2	7,400	144	7,544	C
	Del Monte Avenue	Sutter Bypass	Rural Arterial	2	5,500	144	5,644	B
	Sutter Bypass	George Washington Blvd	Rural Arterial	2	5,800	144	5,944	B
	George Washington	Junction Route 99	Rural Arterial	2	3,850	144	3,944	B
SR 99	Sacramento County	Riego Road	Expressway	4	39,500	198	39,698	C
	Riego Road	Sankey Road	Expressway	4	33,500	198	33,698	C
	Sankey Road	Howsley Road	Expressway	4	33,500	198	33,698	C
	Howsley Road	SR 70	Expressway	4	33,500	198	33,698	C
	Junction SR 70	Garden Highway	Rural Arterial	2	16,200	198	16,398	D
	Garden Highway	Sacramento Avenue	Rural Arterial	2	17,400	198	17,598	E
	Sacramento Avenue	Tudor Road	Rural Arterial	2	17,600	198	17,798	E
	Tudor Road	Junction SR 113	Rural Arterial	2	14,400	198	14,598	D
	Junction SR 113	O'Banion Road	Rural Arterial	2	17,300	0	17,300	E
	O'Banion Road	Oswald Road	Expressway	4	17,300	0	17,300	A

The surrounding roadways currently operate well below capacity given the remote and rural nature of the area, and the existing low daily volumes on these roadways. The proposed project would result in temporary, short-term increases in local traffic as a result of construction-related workforce traffic (employee travel to and from the site) and material deliveries. Based on the above analysis, during peak construction, the project is projected to add 360 daily trips, with 128 trips occurring during the morning peak hour and 128 trips occurring during the afternoon peak hour. Based on the County's roadway thresholds presented in Table 3.11-1, sufficient capacity exists to accommodate the temporary increase in traffic during project construction and the increase will have little effect on roadway and intersection operations. The roadways and intersections will still be well within the County's range of acceptable operations. This is considered a conservative estimate since it was assumed that 100 percent of the workforce would drive alone and arrive during the peak hours. However, given the remote location of the project site, the high cost of fuel, and the type of construction being conducted, it is likely that a portion of the construction workforce will carpool. In addition, construction work typically begins early (before 7:00 AM) and finishes early (by 3:30 PM), further reducing the number of vehicles during the peak hour.

3.11.3 Mitigation Measures

No significant impacts to transportation will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not recommended.

It should be noted that a traffic control plan (TCP) may be warranted during construction, as stipulated in the Commission Decision Condition of Certification TRANS-6. The TCP should address timing of heavy equipment and building materials delivery, signing, lighting, flaggers, lead vehicles, and traffic control placement. The TCP should be prepared in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and the California Supplement of the MUTCD and approved by the appropriate reviewing agency.

3.11.4 Consistency with LORS

SEC, as amended, will remain consistent with all applicable LORS related to traffic and transportation.

3.11.5 References Cited

Sutter County. 2010. General Plan Draft Environmental Impact Report, Chapter 6.14 Transportation and Circulation. September. Website: http://www.co.sutter.ca.us/doc/government/depts/cs/ps/gp/gp_documents

Sutter County. 2008 General Plan Technical Background Report. Chapter 3 Infrastructure and Community Services. February. Website: http://www.co.sutter.ca.us/doc/government/depts/cs/ps/gp/gp_documents

3.11.6 Conditions of Certification

SEC does not request changes to the traffic and transportation Conditions of Certification.

3.12 Visual Resources

The Commission Decision determined that, with implementation of the mitigation measures specified by the visual resources Conditions of Certification, the project would not have significant impacts on visual resources. The proposed project modifications will result in changes that may be noticeable to offsite observers.

3.12.1 Environmental Baseline Information

To provide a basis for evaluating and documenting any changes to the environmental baseline for visual resources that may have occurred since the time the AFC visual resources analysis was prepared, a visit to the project site was made, and the current views from each of the key observation points (KOP) used in preparing the AFC visual analysis were observed and photo documented.[4] Figure 3.12-1 is a map of the project area on an aerial photo base that indicates the locations of KOPs 1 through 5 from the AFC visual analysis. Figures 3.12-2 through 3.12-6 (at the end of this section) present photos that represent the existing conditions from each of the KOPs.

To a large degree, the visual conditions in the project area are the same as those documented at the time the AFC was prepared. However, a specific change is that SEC is now in place on the site adjacent to the cogeneration plant. SEC is visible in the views from KOPs 1, 3, and 4 (Figures 3.12-2, 3.12-4, and 3.12-5). Both the adjacent cogeneration plant and the SEC facilities are now surrounded by rows of trees planted around the perimeter of the sites at the time of SEC's initial development, and these trees have now grown to a moderate height (these trees are most readily visible in the view from KOP 4 (Figure 3.12-5). The 230 kV transmission line on tubular steel poles that was developed as a part of the SEC project is now visible along the west side of Township Road (KOPs 4 and 5 [Figures 3.12-5 and 3.12-6]) and the south side of O'Banion Road. The switching station that was developed in conjunction with the project is now visible alongside Western's transmission line at the west end of O'Banion Road. In addition to the visual changes in the project area resulting from development of SEC, the area's landscape has changed in since the AFC was prepared in 1997. A number of large agricultural parcels in the project vicinity had been converted to orchards, and the small saplings that were in place at that time are now mature orchard trees. As a result of this tree growth, in the views from KOPs 2 and 5 (Figures 3.12-3 and 3.12-6) from which the project site had been visible at the time of the AFC analysis, the views are now completely screened by the trees.

3.12.2 Environmental Consequences

Figure 3.12-5 presents both the existing view looking toward SEC and a simulation of this view as it would appear with the proposed project changes in place. Comparison of the existing view with the simulation of the with-project conditions indicates that the visual changes would be limited. The auxiliary boiler and stack that will be built to the east of the easternmost HRSG will not be visible because they will be screened by the vegetation that is now established along the perimeter of the site. The only visible change will be the extension of the ACC to the west. This extension of the ACC would increase its apparent mass to a small degree. This extension of the ACC would increase the blockage of the view from KOP-4 to the Sutter Buttes in the background to a small extent, but the overall visual change to the view of the buttes would be relatively small.

Because the proposed generator tie-line will be located underground, it will not be visible, and will thus have no visual effects. The substation, like the substation approved as a part of the original project license, will be located adjacent to an existing transmission corridor in an area that is distant from residences. Although the substation structural components will have some height and could be visible at a distance, they are absorbed into the background when seen in the middleground or background. This is because the structures are open and do not present a visual mass, and because they are very similar to the transmission tower structures in the adjacent transmission line corridor. Therefore, the visual changes resulting from the proposed project modifications will be

[4] For the purposes of this analysis, only KOPs 1–5 from the AFC were considered. Because KOP 6 had been selected for evaluation of the impacts of the project's transmission line at a location far from the power plant and because the power plant was not included in the view, it is not pertinent for this analysis.

subtle and will not change the conclusions about project visual impacts that were reached in the CEC Commission Decision.

3.12.3 Mitigation Measures

No significant impacts to visual resources will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not recommended.

3.12.4 Consistency with LORS

The construction and operation of SEC, as amended, will conform with all applicable LORS related to visual resources as identified in the Appendix A to the Commission Decision.

3.12.5 Conditions of Certification

SEC does not request changes to the visual resources Conditions of Certification.

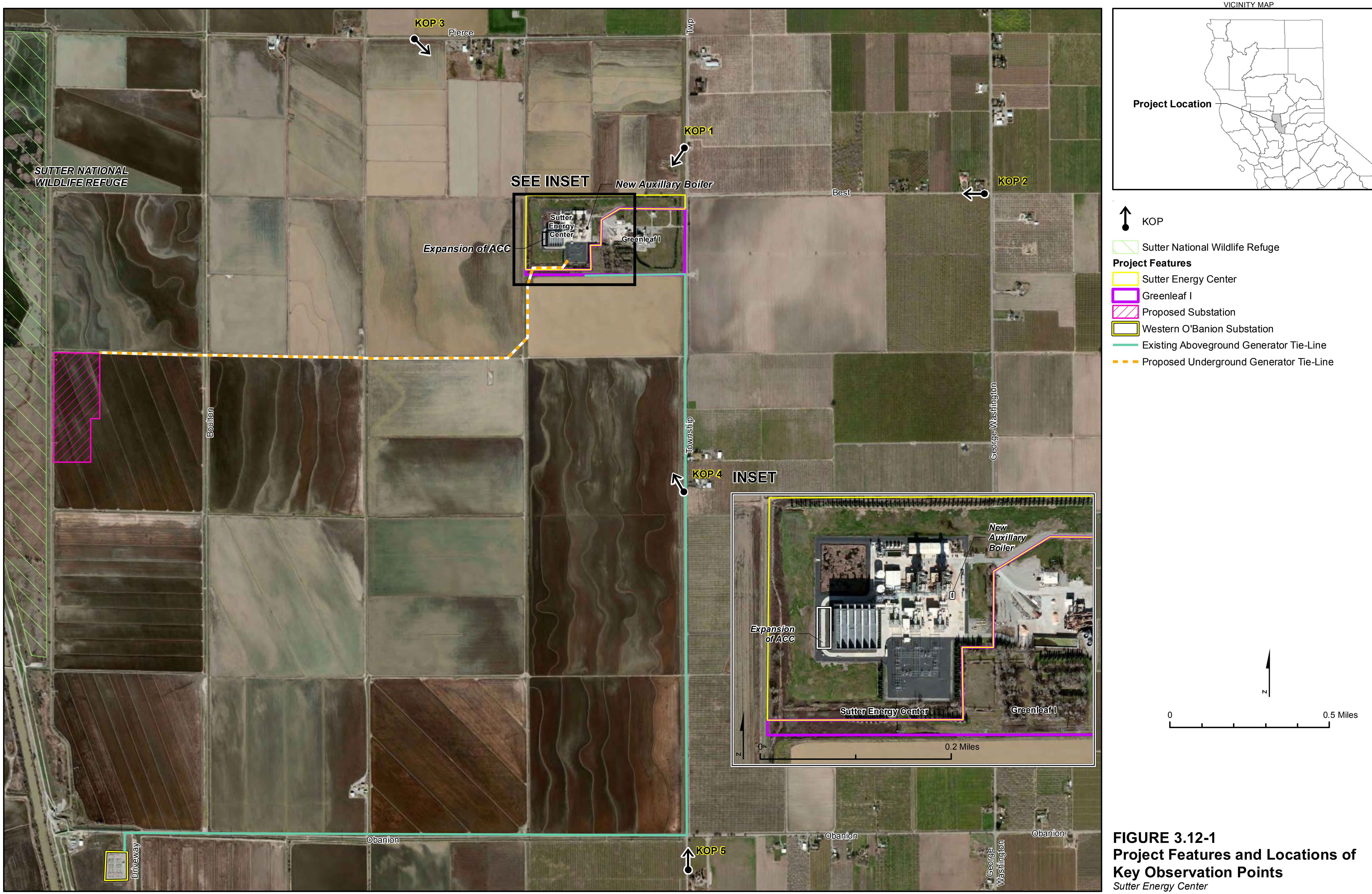


FIGURE 3.12-1
Project Features and Locations of Key Observation Points
Sutter Energy Center

SAC P:\SUTTER_ENERGY_CENTER\MAPFILES\SEC_KOP.MXD GPERDEW 2/19/2013 12:13:02 PM

CH2MHILL.

KOP 1 - Existing view looking toward the Greenleaf 1 cogeneration plant and the Sutter Energy Center from the west side of the road across from the residence located on South Township Road, just north of Best Road.

FIGURE 3.12-2
KOP-1 Existing View
Sutter Energy Center

KOP 2 - Existing view in the direction of the project site from the Best Road, just west of George Washington Boulevard. The orchard trees that were saplings at the time this KOP was used to evaluate the impacts of the Sutter Energy Center have now matured and completely block the views toward the project, even in winter.

FIGURE 3.12-3
KOP-2 Existing View
Sutter Energy Center

CH2MHILL

KOP 3 - Existing view toward the Greenleaf 1 cogeneration plant and the Sutter Energy Center from near one of the residences along Pierce Road, northwest of the project site.

FIGURE 3.12-4
KOP-3 Existing View
Sutter Energy Center

CH2MHILL

a. KOP 4 - Existing view toward the Greenleaf 1 cogeneration plant and the Sutter Energy Center from the west side of the road across from two residences located on South Township Road southeast of the project site.

b. KOP 4 - Simulation of the view as it would appear with the proposed project changes.

FIGURE 3.12-5
KOP-4 Existing View and Simulated View with ACC Expansion and Auxiliary Boiler
Sutter Energy Center

CH2MHILL

a. KOP 5 - Existing view in the direction of the project site from South Township Road south of O'Banion Road. The orchard trees that were saplings at the time this KOP was used to evaluate the impacts of the Sutter Energy Center have now matured and completely block the views toward the power plant. The transmission line that was built along the west side of South Township Road as a part of the Sutter Energy Center project is readily visible.

b. KOP 5 - Simulation of the view as it would appear after completion of the project if the decision is made to remove the transmission line that now runs along the west side of South Township Road.

FIGURE 3.12-6
KOP-5 Existing View and Simulated View with Existing Generator Tie-Line Removed
Sutter Energy Center

3.13 Waste Management

Waste management will not differ significantly from that described in the AFC and addressed in SEC's existing Operational Waste Management Plan (WMP). Because of the WMP and Conditions of Certification, any potential waste management impacts associated with this Petition would be less than significant.

3.13.1 Environmental Baseline Information

Wastewater, nonhazardous waste, and hazardous waste will be generated during construction of the auxiliary boiler, ACC expansion, generator tie-line, and substation. It is anticipated that operation waste production will be similar if not identical to that already produced at SEC, and is therefore not discussed further. All waste will be disposed of in accordance with the project's existing Operational WMP, which details types of wastes created and appropriate disposal of each waste.

3.13.1.1 Construction Waste Generation

During construction activities for the auxiliary boiler, ACC expansion, generator tie-line, and substation, the primary waste generated will be nonhazardous waste, however, some hazardous waste will also be generated. The types of waste and their estimated quantities are described in the following discussion. Typical wastes generated during construction are identified in Table 3.13-1.

TABLE 3.13-1
Wastes Generated during the Construction Phase

Waste	Origin	Composition	Estimated Quantity	Classification	Disposal
Scrap wood, glass, plastic, paper, calcium silicate insulation, and mineral wool insulation	Construction	Normal refuse	333 pounds per month (dumpster)	Nonhazardous	Recycle and/or dispose of in a Class II or Class III landfill
Scrap metals	Construction	Parts, containers	50 pounds per month	Nonhazardous	Recycle and/or dispose of in a Class III landfill
Concrete	Construction	Concrete	1.5 tons during construction	Nonhazardous	Recycle and/or dispose of in a Class III landfill
Empty liquid material containers	Construction	Drums, containers, totes	20 containers	Nonhazardous solids	Containers <5 gallons will be disposed of as normal refuse. Containers >5 gallons will be returned to vendors for recycling or reconditioning.
Spent welding materials (for example, welding rods)	Construction	Solid	5 pounds per month	Nonhazardous	Recycle with vendors or dispose of at a Class I landfill if hazardous
Waste oil filters	Construction equipment and vehicles	Solids	5 pounds per month	Nonhazardous	Recycle at a permitted TSDF
Used and waste lube oil	CTG and STG lube oil flushes	Hydrocarbons	7 drums (life of project construction)	Hazardous	Recycle at a permitted TSDF

TABLE 3.13-1
Wastes Generated during the Construction Phase

Waste	Origin	Composition	Estimated Quantity	Classification	Disposal
Oily rags, oil sorbent excluding lube oil flushes	Cleanup of small spills	Hydrocarbons	5 pounds per month	Hazardous	Recycle or dispose of at a permitted TSDF
Solvents, paint, adhesives	Maintenance	Varies	150 pounds per month	Hazardous	Recycle at a permitted TSDF
Spent lead acid batteries	Construction equipment, trucks.	Heavy metals	5 to 10 batteries	Hazardous	Store no more than 10 batteries (up to 1-year) – recycle offsite.
Spent alkaline batteries	Equipment	Metals	5 to 10 batteries	Universal Waste solids	Recycle or dispose of offsite at an Universal Waste Destination Facility
Waste oil	Equipment, vehicles	Hydrocarbons	5 gallons per month	Non-RCRA Hazardous Liquid	Dispose of at a permitted TSDF
Sanitary waste	Portable toilet holding tanks	Sewage	50 gallons per day	Nonhazardous Liquid	Remove by contracted sanitary service
Fluorescent, mercury vapor lamps	Lighting	Metals and PCBs	5 to 10 pounds per year	Universal Waste solids	Recycle or dispose of offsite at an Universal Waste Destination Facility

RCRA = Resource Conservation and Recovery Act of 1976
TSDF = Treatment, storage, and disposal facility

Nonhazardous Solid Waste

The following nonhazardous waste streams potentially could be generated during construction of the auxiliary boiler, ACC expansion, new generator tie-line, and substation:

- **Paper, wood, glass, and plastics.** Approximately 1.5 tons of paper, wood, glass, and plastics will be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers during project construction. These wastes will be recycled where practical. Waste that cannot be recycled will be disposed of weekly in a Class III landfill. Onsite, the waste will be placed in dumpsters.
- **Metal.** Approximately 1,000 pounds of metal including steel (from welding and cutting operations, packing materials, and empty nonhazardous chemical containers) and aluminum waste (from packing materials and electrical wiring) will be generated during construction. Waste will be recycled, where practical, and nonrecyclable waste will be deposited in a Class III landfill.

Wastewater

Wastewater generated during construction will include sanitary waste, stormwater runoff, equipment washdown water, and potentially water from excavation dewatering during construction (if dewatering is required). Depending on the chemical quality of these wastewaters, they could be classified as hazardous or nonhazardous. If needed, wastewater would be sampled and if found hazardous would be properly disposed of offsite.

Hazardous Waste

Most of the hazardous waste generated during construction will consist of water from excavation dewatering (if it contains contaminants), solvents, welding materials and dried paint.

The quantity of welding, solvent, and paint waste is expected to be minimal.

3.13.1.2 Solid Waste Disposal

Nonhazardous waste (often referred to as municipal waste or garbage) will be recycled or deposited in a Class III landfill. The facility currently disposes of nonhazardous solid waste through Yuba Sutter Disposal Inc., and will continue to do so through the construction of the auxiliary boiler, ACC expansion, generator tie-line, and substation. Hazardous wastes will be delivered to a permitted offsite TSDF for treatment or recycling, or will be deposited in a permitted Class I landfill as identified in SEC's existing Operational WMP. The project is not expected to have any significant environmental impacts related to solid waste disposal.

Nonhazardous Waste

Approximately 3.7 tons of nonhazardous waste will be generated during construction. In addition, nonhazardous waste will continue to be generated during operation in similar quantities as to what is currently generated. Nonhazardous wastes will be recycled to the extent possible, and what cannot be recycled will be disposed of at a permitted landfill as discussed in the project's Operational WMP.

It is anticipated that any excavated soil will be used onsite for grading and leveling purposes, and as backfill. In the event that some excavated soil is not reused onsite, it would be classified for disposal on the basis of sampling completed once the soil is excavated and stockpiled. Soil determined to be nonhazardous could be suitable for reuse at a construction site or disposal at a regional disposal facility.

Hazardous Waste

As described in the Operational WMP, the SEC facility is designated a Large Quantity Generator, hazardous waste generated will be stored at the facility for less than 90 days. The waste will then be transported to a TSDF by a permitted hazardous waste transporter.

According to the Department of Toxic Substance Control, there are over 50 facilities in California that can accept hazardous waste for treatment and recycling (DTSC, 2012). For ultimate disposal, California has three hazardous waste (Class I) landfills. The closest commercial hazardous waste disposal facility is Waste Management's Kettleman Hills Landfill.

Waste Management Kettleman Hills Landfill

This facility accepts Class I and II waste. The B-18 landfill is permitted for and will accept all hazardous wastes except radioactive, medical, and unexploded ordnance. Currently, B-18 landfill phase 1 and 2 are in operation with a permitted capacity of 10.7 million cubic yards. B-18 phase 1 and 2 are near capacity, but B-18 phase 3 will be opening with a permitted capacity of approximately 5 million cubic yards and a life expectancy of 8 years (Henry, 2012). After B-18 closes, a new B-20 landfill will be opened on currently undeveloped land on the site. B-20 has a permitted capacity of 15 million cubic yards and a life expectancy of 24 years (Henry, 2012). As a whole, Kettleman Hills Landfill will be accepting waste for the next 32 years, until 2044. However, it is continuously searching for more expansion opportunities (Henry, 2012).

Clean Harbors Buttonwillow Landfill

This landfill is permitted at 13.1 million cubic yards and can accept 4,050 tons per day (Linton, 2012). The landfill is permitted to accept waste until 2040 (CalRecycle, 2012a). Buttonwillow has been permitted to manage a wide range of hazardous wastes, including RCRA hazardous wastes, California hazardous waste, and nonhazardous waste for stabilization treatment, solidification, and landfill. It can handle waste in bulk (solids and liquids) and in containers. Typical waste streams include nonhazardous soil, California hazardous soil, hazardous soil for direct landfill, hazardous waste for treatment of metals, plating waste, hazardous and nonhazardous liquid, and debris for microencapsulation (Linton, 2012).

Clean Harbors Westmoreland Landfill

This facility is not currently open and accepting waste because the Buttonwillow facility can accommodate the current hazardous waste generation rate. The facility is, however, available in reserve and could be reopened if necessary. The landfill's conditional use permit prohibits the acceptance of some types of waste, including radioactive (except geothermal) waste, flammables, biological hazard waste (medical), PCBs, dioxins, air- and water-reactive wastes, and strong oxidizers.

3.13.1.3 Waste Disposal Summary

The SEC facility will generate nonhazardous waste that will add to the total waste generated in Sutter County and in California. However, there is adequate recycling and landfill capacity in California to recycle and dispose of the waste generated during the new activities. It is estimated that the additional facilities for the SEC project will generate approximately 4 tons of solid waste during construction (including approximately 0.3 tons of hazardous waste), Considering that 229,781 tons of solid waste was landfilled in Sutter/Yuba County[5] in the year 2011, SEC's additional contribution will likely represent less than one percent of the county's total waste generation in a single year (CalRecycle, 2013). Therefore, the impact of the project on solid waste recycling and disposal capacity will not be significant.

Hazardous waste generated will consist of waste oil, filters, and fluids used to clean piping. The waste oil, and the deionization trailer wastes will be recycled when feasible. Hazardous waste treatment and disposal capacity in California is more than adequate. Therefore, the effect of the project modifications on hazardous waste recycling, treatment, and disposal capability will not be significant.

3.13.2 Mitigation Measures

No significant impacts in terms of waste management would result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.13.3 Consistency with LORS

The construction and operation of SEC, as amended, will conform with all applicable LORS related to waste management as identified in the Appendix A to the Commission Decision.

3.13.4 References

CalRecycle. 2013. *2010 Landfill Summary Tonnage* Report, Los Angeles County. http://www.calrecycle.ca.gov/SWFacilities/Landfills/Tonnages/ January 2013.

Department of Toxic Substance Control (DTSC). 2012. *California Commercial Offsite Hazardous Waste Management Facilities*. http://www.envirostor.dtsc.ca.gov/public/commercial_offsite.asp. April 2012.

Henry, Bob / Waste Management – Kettleman Hills Landfill. 2012. Personal communication with Beth Storelli/CH2M HILL. January 12.

Linton, Ken/ Clean Harbors Buttonwillow Landfill. 2012. Personal communication with Beth Storelli/CH2M HILL. January 11.

Hochstrasser, Margaret. 2013. Personal communication with Sarah Madams/CH2M HILL. January 17.

3.13.5 Conditions of Certification

SEC does not request changes to the waste management Conditions of Certification.

[5] The Yuba County Environmental Health Department serves Yuba and Sutter Counties as the Local Enforcement Agency. Therefore, although the SEC is located within Sutter County, landfill data is available only for Yuba County. In addition, landfills serving Sutter County are all located within Yuba County (Hochstrasser, 2013).

3.14 Worker Safety and Fire Protection

Since all workers will undergo proper training under the terms of the current license, the proposed modifications to the project will not result in impacts different than those analyzed by the CEC during certification. As a result, any potential worker safety and fire protection impacts associated with this Petition will be less than significant.

3.14.1 Environmental Baseline Information

The project modifications will not result in any new or additional impacts to worker safety and fire protection.

3.14.2 Environmental Consequences

No new significant impacts to worker safety and fire protection would result from the construction of the auxiliary boiler, ACC expansion, new generator tie-line, and substation.

3.14.3 Mitigation Measures

No significant impacts in terms of worker safety and fire protection will result from the approval of this Petition. Therefore, mitigation measures beyond those stipulated in the Commission Decision are not necessary.

3.14.4 Consistency with LORS

Additional LORS are now in place since the initial AFC and are identified in Table 3.14-1. The construction and operation of SEC, as amended, will conform with all applicable LORS related to worker safety and fire protection as identified in Table 3.14-1 and in the Appendix A to the Commission Decision.

TABLE 3.14-1
Additional Laws, Ordinances, Regulations, and Standards Applicable for Worker Health and Safety

LORS	Applicability
State	
8 CCR 5110, et. seq.	Requirements for the implementation of an ergonomics program
Applicable National Consensus Standards for Worker Health and Safety	
National Fire Prevention Association (NFPA) 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems	Requirements for the periodic inspection, testing, and maintenance of water-based fire protection systems, including land-based and marine applications.
NFPA 85, Boiler and Combustion Systems Hazard Code	Requirements for boiler design, installation, operation, maintenance, and training
American National Standards Institute/American Society for Mechanical Engineers (ANSI/ASME), Boiler and Pressure Vessel Code	Specifications and requirements for pressure vessels

3.14.5 Conditions of Certification

This Petition does not require changes to the worker safety and fire protection Conditions of Certification.

3.15 LORS

The Commission Decision certifying SEC concluded that the project is in compliance with all applicable LORS. SEC, as amended, will continue to comply with all applicable LORS.

SECTION 4.0

Potential Effects on the Public

This section discusses the potential effects on the public that may result from the modifications proposed in this Petition to Amend application, pursuant to CEC Siting Regulations (Title 20, CCR, Section 1769[a][1][G]).

Changes to project components will result in no greater impacts on the public and property owners than those analyzed during project licensing, resulting in no effect on the public and property owners beyond what was originally approved by the CEC.

Therefore, impacts on the public and property owners are expected to be the same as those analyzed during the license proceeding for the project.

SECTION 5.0

List of Property Owners

A list of the property owners, in accordance with the CEC Siting Regulations (Title 20, CCR, Section 1769[a][1][H]) will be provided under separate cover to the Compliance Project Manager.

SECTION 6.0

Potential Effects on Property Owners

This section addresses potential effects of the project changes proposed in this Petition to Amend on nearby property owners, the public, and parties in the application proceeding, pursuant to CEC Siting Regulations (Title 20, CCR, Section 1769 [a][1][I]).

The project, as modified, will not differ significantly in potential effects on adjacent land owners, compared with the project as previously proposed. The project, therefore, would have no adverse effects on nearby property owners, the public, or other parties in the application proceeding.

Appendix 2.1A
PG&E North Area Cluster 1/Cluster 2 Phase II Study

Cluster 1 / Cluster 2 Phase II Interconnection Study Report

Group Report for the PG&E North Area

Final Report

(Revision 1)

January 13, 2012

This study has been completed in coordination with Pacific Gas & Electric per CAISO Tariff Appendix Y Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window

Table of Contents

Appendices:

A. **Individual Project Report**
B. **Contingency Lists**
C. **Deliverability Assessment Results**
D. **Steady State Power Flow Plots**
E. **Reliability Assessment Results**
F. **Short Circuit Study Results**

Definitions

AVR	Automatic Voltage Regulation
CAISO	California Independent System Operator Corporation
COD	Commercial Operation Date
Deliverability Assessment	CAISO's Deliverability Assessment
DTT	Direct Transfer Trip
EO	Energy Only Deliverability Status
FC	Full Capacity Deliverability Status
FERC	Federal Energy Regulatory Commission
IC	Interconnection Customer
LGIA	Large Generator Interconnection Agreement
LGIP	Large Generator Interconnection Procedures
Max	Maximum generation output
NERC	North American Electric Reliability Corporation
NQC	Net Qualifying Capacity as modeled in the Deliverability Assessment:
NQCRS	Net Qualifying Capacity as modeled in the Reliability Study:
PG&E	Pacific Gas and Electric Company
Phase II Study	Cluster 1/Cluster 2 Phase II Study
PTO	Participating Transmission Owner
RA	Resource Adequacy
RAS	Remedial Action Scheme (also known as SPS)
POI	Point of Interconnection
POS	Plan of Service
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
SPS	Special Protection System (also known as RAS)
SVC	Static VAr Compensator
TPP	CAISO's Transmission Planning Process
WECC	Western Electricity Coordinating Council

1. Executive Summary

In accordance with the Federal Energy Regulatory Commission (FERC) approved Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window (CAISO Appendix Y), this Cluster 1 / Cluster 2 Phase II study was initiated to determine the combined impact of all the Cluster 1, Cluster 2 and SGIP Transition Cluster projects (C1C2 projects) on the CAISO controlled-grid.

Based on their geographical locations, the C1C2 projects were grouped together for efficient study process purposes. There were ten (10) generation projects that were assigned to the North Cluster 1/Cluster 2 Group for the Phase II Study. This study report provides the following:

1. Transmission system impacts caused by the addition of the PG&E North Area Group C1C2 projects,

2. System reinforcements necessary to mitigate the adverse impacts of the PG&E North Area Group C1C2 projects under various system conditions, and

3. A list of required facilities, a cost responsibility for Network Upgrades assigned to each Interconnection Request and a non-binding, good faith estimate of the Interconnection Facilities cost and time to construct for each Interconnection Request.

To determine the system impacts caused by the PG&E North Area Group C1C2 projects, the following studies were performed:

- Steady State Power Flow Analyses
- Short Circuit Duty Analyses
- Transient Stability Analyses
- Reactive Power Deficiency Analyses
- Deliverability Assessment
- Operational Studies

The results of above studies indicated that the PG&E North Area Group C1C2 projects are responsible for the overloading of several transmission facilities, overstressing of several circuit breakers at a number of substations in the PG&E service territory, and cause the PG&E system to fail to meet the applicable voltage criteria. Network Upgrades[1] to mitigate identified problems have been proposed in this report. The following tables show a summary of the proposed Network Upgrades along with the estimated costs.

[1] The transmission facilities beyond the Point of interconnection (POI), necessary to interconnect the Project, which would not have been necessary but for the interconnection of the Project.

Table A – Reliability Network Upgrades for Mitigating the Identified Concerns (x 1,000)

1	Install SPS to mitigate overload of the Contra Costa – Brentwood 230 kV Line	$2,500
2	Install SPS to mitigate overload of the Pit #1 - Cottonwood 230 kV Line	$2,500
3	Install SPS to mitigate overload of the Pit #1 – Pit #3 230 kV Line	$2,500
4	Install SPS to mitigate overload of the Round Mt. 500/230 kV Bank #1 *(Note 1)*	$1,500
5	Replace overstressed 500 kV circuit breakers at Tesla Substation	$9,000
6	Install 500 kV Series Capacitors at new Q569 Switching Station	$20,000
7	Install 5 MVAr Reactor at the Q642 Switching Station	$3,000
	Total Allocated PG&E Reliability Upgrades Cost for PG&E's North Area Group	**$41,000**

Note 1: PG&E Company should investigate the use of the equipment emergency rating as a potential mitigation plan.

Table B – Delivery Network Upgrades (x 1,000)

1	Reconductor the Carberry Switching Station – Round Mt. 230 kV Line	$17,200
2	Replace Limiting Equipment on the Contra Costa PP – Contra Costa Sub 230kV Line	$250
	Total Allocated PG&E Delivery Upgrades Cost for PG&E's North Area Group	**$17,450**

The upgrades in the Tables above do not include Interconnection Facilities and Non-Network Non-CAISO Transmission Upgrades, which are the obligation of each Interconnection Customer to finance. These interconnection facilities relating to each individual project are discussed in the corresponding Appendix A Individual Project Report.

Given the magnitude of above upgrades, a good faith estimate to engineer, license, procure, and construct these facilities could be 36-48 months from the execution of all required Generator Interconnection Agreements (GIAs).

2. Cluster 1/Cluster 2 Interconnection Information

Ten (10) generation projects totaling a maximum output of 1,006.5 MW are included in the PG&E North C1C2 Group. Table 2-1 lists all the generator projects with essential data obtained from the CAISO Generation Interconnection Queue.

Table 2-1: PG&E C1C2 Projects

CAISO Queue	Point of Interconnection	Full Capacity Energy Only	Fuel	Max MW	Commercial Operation Date
489	Birds Landing Switching Station	FC	Wind	98.9	5/31/2014
495	Melones-Riverbank 115 kV Line	FC	Hydro	7.2	12/31/2012
554	Carberry 230 kV Switching Station	FC	Wind	135	12/31/2013
568	Eastshore Substation 230 kV bus	FC	Natural Gas	25	6/1/2012
569	Table Mountain-Tesla 500 kV Line	FC	Natural Gas	600	1/1/2015
586	Geysers #17-Fulton 230 kV Line	FC	Geothermal	49.9	5/31/2013
606	Schulte 115 kV Switching Station	FC	Natural Gas	20	6/1/2012
642	Elk Creek 60 kV Tap	EO	Solar	20	7/1/2013
649A	Dixon-Vaca #2 60 kV Line	EO	Solar	18.5	3/1/2013
651	Nicolaus-Marysville 60 kV Line	EO	Solar	20	6/1/2012
653F	Woodland-Davis 115 kV Line	EO	Solar	12	5/1/2012
Total C1C2 Phase II Generation				**1,006.5**	**N/A**

3. Study Objectives

This Phase II Interconnection study was performed in accordance with Section 7.1 of Appendix Y of the CAISO tariff, which states:

"The Phase II Interconnection Study shall:

(i) update, as necessary, analyses performed in the Phase I Interconnection Studies to account for the withdrawal of Interconnection Requests,
(ii) identify final Reliability Network Upgrades needed to physically interconnect the Large Generating Facilities,
(iii) assign responsibility for financing the identified final Reliability Network Upgrades,
(iv) identify, following coordination with the CAISO's Transmission Planning Process, final Delivery Network Upgrades needed to interconnect those Large Generating Facilities selecting Full Capacity Deliverability Status,
(v) assign responsibility for financing Delivery Network Upgrades needed to interconnect those Large Generating Facilities selecting Full Capacity Deliverability Status,

(vi) identify for each Interconnection Request final Point of Interconnection and Participating TO's Interconnection Facilities,

(vii) provide a +/-20% estimate for each Interconnection Request of the final Participating TO's Interconnection Facilities,

(viii) optimize in-service timing requirements based on operational studies in order to maximize achievement of the Commercial Operation Dates of the Large Generating Facilities, and

(ix) if it is determined that the Delivery Network Upgrades cannot be completed by the Interconnection Customer's identified Commercial Operation Date, provide that operating procedures necessary to allow the Large Generating Facility to interconnect as an energy-only resource, on an interim-only basis, will be developed and utilized until the Delivery Network Upgrades for the Large Generating Facility are completed and placed into service.

(x) specify and estimate the cost of the equipment, engineering, procurement and construction work, including the financial impacts (i.e., on Local Furnishing Bonds), if any, and schedule for effecting remedial measures that address such financial impacts, needed on the CAISO Controlled Grid to implement the conclusions of the updated Phase II Interconnection Study technical analyses in accordance with Good Utility Practice to physically and electrically connect the Interconnection Customer's Interconnection Facilities to the CAISO Controlled Grid.

(xi) also identify the electrical switching configuration of the connection equipment, including, without limitation: the transformer, switchgear, meters, and other station equipment; the nature and estimated cost of any Participating TO's Interconnection Facilities and Network Upgrades necessary to accomplish the interconnection; and an estimate of the time required to complete the construction and installation of such facilities.

All the required analysis was completed to identify the Interconnection Facilities and Network Upgrades necessary to safely and reliably interconnect the C1C2 projects into the CAISO controlled-grid. An estimated cost and construction schedule for these facilities has also been provided in this report.

4. Study Assumptions

4.1 Power flow base cases

The Phase II Study used three power flow base cases; one for Deliverability Assessment and two for Reliability Assessment, representing 2014 summer peak and 2014 summer off-peak system conditions. These base cases included all CAISO approved transmission projects that are scheduled to be in service by 2014. Also all higher queued CAISO/PG&E serial, Transition Cluster, small generation (SGIP) and wholesale distribution (WDT) projects as well as their associated network upgrades including Special Protection Systems are modeled.

4.2 Load and Import

The Deliverability Assessment On-Peak case modeled a 27,140 MW load (1-in-5 load forecast) in PG&E's electric system with an import target as shown in Table 4-1.

Table 4-1: On-Peak Deliverability Assessment Import Target

Branch Group (BG) Name	BG Import Direction	Net Import MW	Import Unused ETC MW
LUGOVICTVL_BG	N-S	1138	171
COI_BG	N-S	3770	548
BLYTHE_BG	E-W	107	0
CASCADE_BG	N-S	1	0
CFE_BG	S-N	-55	0
ELDORADO_BG	E-W	1158	0
IID-SCE_BG	E-W	315	0
IID-SDGE_BG	E-W	-159	0
INYO_BG	E-W	0	0
LAUGHLIN_BG	E-W	0	0
MCCULLGH_BG	E-W	30	316
MEAD_BG	E-W	469	505
MERCHANT_BG	E-W	439	0
N.GILABK4_BG	E-W	-140	168
NOB_BG	N-S	1469	0
PALOVRDE_BG	E-W	3139	175
PARKER_BG	E-W	108	27
SILVERPK_BG	E-W	0	0
SUMMIT_BG	E-W	0	0
SYLMAR-AC_BG	E-W	0	471

The Reliability Assessment 2014 Heavy Summer case modeled a 27,967 MW load (1-in-10 load forecast). Approximately 4,800 MW on Path 66 and 4000 MW on Path 26 north-to-south flow were modeled in the base case.

The Summer Off-Peak case represented about 50% of summer peak load with adjustment in generation dispatch and import levels to create a load / generation balance.

While it is impractical to study all combinations of system load and generation levels during all seasons and at all times of the day, the base cases were developed to represent stressed scenarios of loading and generation conditions for the study group area.

4.3 Generation Dispatch

Generation dispatch in the Reliability Assessment for 2014 Summer peak conditions represents high generation output levels for the North Area of the PG&E system. The generation dispatch is shown in Table 4-2, and includes only major existing generation in the PG&E North Area. This dispatch is prior to adding the C1C2 projects to the system. After adding the C1C2 projects at high output levels, the generator output in other local areas or in other PTO systems was decreased by an equal amount to maintain generation / load balance in the power flow case.

Table 4-2: Existing PG&E North Area Generation

Generation unit	Size (MW)
Consumnes Power Plant (SMUD)	500
Solano Wind Phase 1 and Phase 2	100
UTE Vaca Dixon	49
FPLE High Winds	162
Vaca Dixon	49
Lambie Energy	48
Goosehaven	48
Creed	48
Shiloh I	150
Shiloh Phase II	150
Wolfskill Energy Center	61
Yuba City Energy Center	61
GWF Tracy Peaker	178
Sutter	0
Helms 1	404
Helms 2	404
Helms 3	404
Total	10,864

For the summer off-peak case, the load level was about 50% of the summer peak load, and the generation was adjusted accordingly.

4.4 New Transmission Projects

All CAISO approved projects as shown in Table 4-3 were modeled in the base cases.

Table 4-3: Planned PG&E System Additions and Upgrades

Project
Atlantic - Lincoln Transmission
Bellota Transformer Bank No. 2 Replacement

Project
Borden - Madera 70 kV new line
Caruthers - Kingsburg 70 kV Line Reconductoring Project
Christie Transformer Bank No. 1 Replacement
Contra Costa - Moraga 230 kV Reconductoring Project
Cooley Landing - Los Altos 60 kV Reconductoring Project
Cooley Landing 115/60 kV Transformer Capacity Increase Project
Corcoran Bank Replacement Project
Country Club 60 kV Bus Upgrade
Crazy Horse Switching Substation
Del Monte - Fort Ord 60 kV Lines Reconductoring
Dumbarton - Newark 115 kV line
East Nicolaus Area Reinforcement
Evergreen - Mabury Voltage Conversion
Fulton - Fitch Mountain 60 kV Line Reconductoring
Garberville Reactive Support
Gates Transformer Bank No. 5 Replacement
Gill Ranch Gas Storage 115 kV Interconnection
Glenn 60 kV Line No.1 Reconductoring
Gold Hill - Clarksville 115 kV Line
Gold Hill - Horseshoe 115 kV Line
Gregg Reactor
Guernsey - Henrietta Reconductoring Project
Half Moon Bay Reactive Support
Henrietta Transformer Bank No.3 Replacement
Herndon 230/115 kV Transformer 3
Herndon Circuit Breaker Replacement Project
Hollister 115 kV Reconductoring Project
Humboldt - Harris 60 kV Reconductoring
Humboldt 115/60 kV Transformer Replacements
Humboldt Reactive Support
Ignacio - San Rafael 115 kV Nos. 1 and 2 Reconductoring
Kerckhoff PH #2 - Oakhurst 115 kV Line Project
Kern - Old River 70 kV Line Reconductoring
Kern Power Plant Bank 1 Replacement
Kern Power Plant Bank 2 Replacement
Lakeville - Ignacio #2 230 kV Line Project
Lakeville No. 2 60 kV Line Switch Upgrade
Le Grand - Dairyland Reconductoring
Lemoore 70 kV Disconnect Switches Replacement Project
Lodi - Industrial 60kV Line Switch Upgrade
Los Banos Transformer Bank No. 1 Replacement

Project
Maple Creek Reactive Support
McKittrick Load Interconnection
Mendocino Coast Reactive Support
Menlo Area 60 kV Switch Replacements
Mesa 115 kV Shunt Capacitors
Metcalf - Evergreen 115 kV (SJ)
Metcalf-Piercy & Swift and Newark-Dixon Ldg 115 kV Upgrade
Midway - Renfro 115 kV Line Reconductoring
Midway-Kern PP 230 kV Lines Nos. 1, 3 and 4 Capacity Increase Project
Missouri Flat - Gold Hill 115 kV Line
Moraga Transformer Capacity Increase
Morro Bay 230/115 kV Transformer Addition
Moss Landing-Salinas-Soledad 115 kV Reconductoring
Mt View/Whisman - Monta Vista 115 kV Lines reconductor
Newark - Ravenswood 230 kV Line
Oakhurst 115 kV Tap Reinforcement
Oakland Underground Cable
Oro Loma – Mendota 115 kV Conversion Project (originally submitted as the Oro Loma 70 kV Project)
Oro Loma 70 kV Area Reinforcement
Palermo - Rio Oso 115 kV Line Reconductoring
Palermo Circuit Breaker Replacement Project
Pease-Marysville 60 kV Line
PIT 1 - PIT 3 230 kV and Round Mountain-Hatchet Ridge 230 kV - Replace Limiting Equipment
Pittsburg - Tesla 230 kV Reconductoring
Pittsburg 230/115 kV Transformer Capacity Increase
Ravenswood - Cooley Landing 115 kV Nos. 1 and 2 Reconductoring
Reedley - Dinuba 70 kV Line Reconductor
Reedley - Orosi 70 kV Line Reconductor
Replace limiting switches at Mendota
Rio Oso - Gold Hill 230 kV Line Reconductoring
Salado - Newman 60 kV Line No. 2 Reconductoring
San Francisco 115 kV Recabling Project
San Mateo - Bair 60 kV Reconductoring Project
San Mateo - Bay Meadows 115 kV Reconductoring
Sanger - California Ave 70 kV to 115 kV Voltage Conversion
Sanger - Reedley 70 kV to 115 kV Conversion Project
Santa Cruz 115 kV Reinforcement Project
Soledad Transformer Capacity Increase Project
South of San Mateo 230 kV Capacity upgrade
Stockton 'A' - Weber 60 kV Line Nos. 1 and 2 Rerate

Project
Table Mountain - Rio Oso 230 kV Line Reconductoring & Tower Raises
Tesla - Newark 230 kV Upgrade
Tesla 115 kV Reconductoring Project
Tri-Valley Voltage Control
Vaca Dixon - Birds Landing 230 kV Reconductoring
Valley Springs 230/60 kV Transmission Addition
Watsonville 115 kV Voltage Conversion
Weber 230/60 kV Transformer Replacement
West Point - Valley Springs 60 kV Line Reinforcement
Wheeler Ridge 230/70 kV Transformer Capacity Increase
Wilson 115 kV Area Reinforcement

4.5 Pre-C1C2 Generation Projects

All pre-C1C2 generation projects, as listed in Table 4-4, were modeled in the base cases. However, some generation projects were either turned off or modeled with reduced generation to create a more stressed case for the Reliability Study.

Table 4-4: Pre-C1C2 Generation Projects

Queue Position	Point of Interconnection
16	Divide – Cabrillo #2 115 kV Line
22	Birds Landing Switching Station
39	Birds Landing Switching Station
42	McCall Substation 115 kV Bus
45	Eastshore Substation
57	Cottonwood – Vaca Dixon 230 kV lines
60	Kern Oil Substation 115 kV
67	Eastshore 230 kV Bus
74	Pit 3 – Round Mountain 230 kV Line
108	Lambie – Contra Costa 230 kV
111	Chevron 70 kV Tap
113	Birds Landing Switching Station
166	Morro Bay – Midway 230 kV Line
172	Tesla – Bellota 230 kV Line
184	Geysers #3 – Cloverdale 115 kV Line
194	Morro Bay – Midway 230 kV Lines
212	Rio Dell Substation 60 kV
222	Birds Landing Switching Station

Queue Position	Point of Interconnection
239	Morro Bay – Midway 230 kV Lines
242	Morro Bay – Midway 230 kV Lines
248	Tesla – Bellota 230 kV Line
250	Redbud – Cortina 115 kV Line
254	Gates Substation 230 kV
258	Contra Costa Substation
267	Gold Hill – Eight Mile 230 kV Line
268	Tesla – Manteca 115 kV Line Via Schulte Swyd
272	Henrietta Substation 70 kV
282	Dairyland – Mendota 115 kV Line
300	Midway Substation 230kV Bus
304	Smyrna – Alpaugh 115 kV Line
320	Contra Costa PP 230 kV Switchyard
334	Kelso Substation 230 kV Bus
340	Smyrna – Alpaugh 115 kV Line
356	Taft – Cuyama #1 70 kV
372	Jacobs Corner Substation 70 kV Bus
378	Los Esteros Substation 115 kV Bus
417	Pittsburg – Tesla 230 kV
470	Jacobs Corner Substation 70 kV Bus
471	Jacobs Corner Substation 70 kV Bus
472	Ultra Power 60 kV Tap
473	Smyrna – Alpaugh 115 kV Line
476	Lakeville #2 60 kV Line
477	Centerville – Table Mountain 60 kV Line
478	Corcoran – Kingsburg #2 115 kV Line
479	Lakeville #2 60 kV
481	Valley Spring – Martel #2 60 kV Line
482	Smyrna – Alpaugh 115 kV Line
484	Blackwell Substation 70 kV Bus
W009	El Capitan Substation - Distribution
W012	Sand Creek Substation - Distribution
W014	Blackwell Substation - Distribution
W017	Wheatland Substation - Distribution
W019	Avenal 70 kV Tap Line
W020	Avenal 70 kV Tap Line
W021	Peabody Substation - Distribution
W022	Avenal 70 kV Tap Line
W023	Newark D Substation - Distribution
W024	Edenvale Substation - Distribution

Queue Position	Point of Interconnection
W025	Goose Lake Substation - Distribution
W026	Smyrna Substation - Distribution
W029	Smyrna Substation - Distribution
W030	Twisselman Substation - Distribution
W031	Tupman Substation - Distribution
W032	Coalinga #2 Substation - Distribution
W033	Oroville Substation - Distribution
W036	Lakeview Substation - Distribution
W044	Elk Hills Substation - Distribution
W045	Coalinga #1 Substation - Distribution
W046	Firebaugh Substation - Distribution
W047	Oro Loma Substation - Distribution
W048	Oro Loma Substation - Distribution
W050	Merced Substation - Distribution
W051	Fulton Substation - Distribution
W052	Giffen Substation - Distribution
W053	Merced Substation - Distribution
W054	Schindler Substation - Distribution
W055	Schindler Substation - Distribution
W057	Blackwell Substation - Distribution
W058	Vaca-Dixon Substation - Distribution
W059	Hicks Substation - Distribution
W060	LeGrand Substation - Distribution
W061	Cheney Substation - Distribution
W062	Huron Substation - Distribution
W063	Gates Substation - Distribution
W064	Gates Substation - Distribution
W065	Stroud Substation - Distribution
W066	Cantua Substation - Distribution
W067	Anita Substation - Distribution
W070	El Nido Substation - Distribution

Reliability Network Upgrades and Delivery Network Upgrades that are associated with these projects were also modeled in the base cases. These upgrades are listed in Table 4-5.

Table 4-5: Network Upgrades for Pre-C1C2 Projects

Network Upgrade Projects
East Shore – San Mateo 230 kV Line Reconductoring
East Shore – Dumbarton 115 kV Line Reconductoring
East Shore 230/115 kV Bank 2 Replacement
GWF Henrietta – Henrietta 70 kV Line Reconductoring
Borden – Gregg 230 kV Line Reconductoring
Contra Costa PP – Delta Pumps 230 kV Line Reconductoring
Kelso – Tesla 230 kV Line Reconductoring
Los Positas – Newark 230 kV Line Reconductoring
Lone Tree – Cayetano 230 kV Line Re-rate
Q239 – Midway #1 230 kV Lines #1 and #2 Reconductoring
Q166 – Q239 230 kV Lines #1 and #2 Reconductoring
Midway – T300 230 kV Lines #1 and #2 Reconductoring
Morro Bay – Gates SPS to trip Q166 and Q194
Gates 230 kV Bus Section 2D SPS to trip Q239 and Q242
Midway – Taft and Fellow – Taft 115 kV SPS to trip Q356
Q239 – Midway #1 and #2 230 kV SPS to trip Q166, Q194, Q239, Q242
Eagle Rock – Fulton – Silverado 115 kV Line SPS to trip Q250

4.6 Other SPSs and Operator Actions

All existing PG&E SPS/RAS are modeled including Path 15 IRAS, Path 26 RAS, Helms RAS and all bulk system load/gen dropping RAS for 500 kV outages. These are in addition to those listed in Table 4-5.

4.6.1 Operating Procedures

Operating procedures, which may include curtailing the output of the C1C2 projects during planned or extended forced outages, may be required for reliable operation of the transmission system. These procedures, if needed, will be developed as needed and before the projects' Commercial Operation Date.

5. Study Criteria and Methodology

The CAISO Controlled Grid Reliability Criteria, which incorporate the Western Electricity Coordinating Council (WECC) and the North American Electric Reliability Council (NERC) planning criteria, were used to evaluate the impact of the C1C2 projects on the CAISO controlled-grid.

5.1 Steady State Study Criteria

5.1.1 Normal Overloads

Normal overloads are those that exceed 100 percent of normal facility ratings. The CAISO Controlled Grid Reliability Criteria requires the loading of all transmission system facilities be within their normal ratings. Normal overloads refer to overloads that occur during normal operating conditions (no contingency).

5.1.2 Emergency Overloads

Emergency overloads are those that exceed 100 percent of emergency ratings. Emergency overloads refer to overloads that occur during single element contingencies (Category “B”) and multiple element contingencies (Category “C”).

5.1.3 Voltage Violations

Single element contingencies (Category “B”) and multiple element contingencies (Category “C”) were analyzed to identify any reactive power deficiency.

Voltage violations will occur if voltage deviations exceed +/- 5% of the pre-disturbance level for Category “B” contingencies and +/ -10% for Category “C” contingencies.

5.1.4 Contingencies

The contingencies used in this analysis are provided in Appendix B. The various categories of the contingencies used are summarized in Table 5-1:

Table 5-1: Power flow contingencies

Contingencies	Description
CAISO Category "A" (No contingency)	All facilities in service – Normal Conditions
CAISO Category "B"	• B1 - All single generator outages. • B2 - All single transmission circuit outages. • B3 - All single transformer outages. • Selected overlapping single generator and transmission circuit outages.
CAISO Category "C"	• C1 - SLG Fault, with Normal Clearing: Bus outages (60-230 kV) • C2 - SLG Fault, with Normal Clearing: Breaker failures (excluding bus tie and sectionalizing breakers) at the same bus section above. • C3 - Combination of any two-generator/transmission line/transformer outages. • C4 - Bipolar (dc) Line • C5 - Outages of double circuit tower lines (60-230 kV) • C6 - SLG Fault, with Delayed Clearing: Generator • C7 - SLG Fault, with Delayed Clearing: Transmission Line • C8 - SLG Fault, with Delayed Clearing: Transformer • C9 - SLG Fault, with Delayed Clearing: Bus Section

Although most of the Category "C" contingencies were considered as part of this study, it is impractical to study all possible combinations of any two elements throughout the system. Therefore, as allowed under NERC standard TPL-003-0 R1.3.1, only selected critical Category "C" contingencies (C1 – C9) that were deemed most severe were evaluated in this study.

5.2 Short Circuit Duty Criteria

Short circuit studies are performed to determine the maximum fault duty on the adjacent buses to the C1C2 projects in the PG&E service territory. This study determines the impact of increased fault current resulting from C1C2 projects. Short circuit results will allocate costs for overstressed breakers to each cluster, which are formed from generation projects with a fault contribution above a threshold value. The Aspen OneLiner Version 10.11 program was used to conduct the detailed short circuit studies with three phase line-to-ground (3LG) and single phase line-to-ground (LG) faults.

To determine the impact on short circuit duty within PG&E's electrical system, after inclusion of the C1C2 generation projects, the study calculated the maximum 3LG and LG short circuit duties. Generation, transformer, and generation tie-line data provided by each C1C2 Interconnection Customer was utilized. Upon completion of the detailed circuit breaker review, circuit breakers exposed to fault currents in excess of 100 percent of their interrupting capacities will need to be replaced or upgraded, whichever is appropriate. It should be noted that other WECC entities may request specific information within the WECC process to evaluate potential impact within their respective systems of this project addition.

PG&E uses the following policy to allocate transmission circuit breaker replacement responsibility for projects that overstress or increase overstress on existing circuit breakers:

- If a breaker is not overstressed before the project, and the project results in an overstressed condition of the breaker, then the project is responsible for the cost of replacement.

- If a breaker is already overstressed, and a project increases the overstress by 5% or more, or the post-project overstress level exceeds 25%, then the project is responsible for the cost of replacement.

- If the overstress level exceeds 25% before the project, and for all other circumstances, PG&E or other generation projects will be responsible for any replacement costs.

The results for this evaluation are detailed in the Appendix A reports.

5.3 Transient Stability Criteria

Transient stability analysis is a time-based simulation that assesses the performance of the power system during (and shortly following) a contingency. Transient stability studies are performed to ensure system stability following critical faults on the system.

The system is considered stable if the following conditions are met:

1. All machines in the WECC interconnected system must remain in synchronism as demonstrated by relative rotor angles (unless modeling problems are identified and concurrence is reached that a problem does not really exist).

2. A stability simulation will be deemed to exhibit positive damping if a line defined by the peaks of the machine relative rotor angle swing curves tends to intersect a second line connecting the valleys of the curves with the passing of time.

3. Corresponding lines on bus voltage swing curves will likewise tend to intersect. A stability simulation, which satisfies these conditions, will be defined as stable.

4. Duration of a stability simulation run will be ten seconds unless a longer time is required to ascertain damping.

5. The transient performance analysis will start immediately after the fault clearing and conclude at the end of the simulation.

6. A case will be defined as marginally stable if it appears to have zero percent damping and the voltage dips are within (or at) the WECC Reliability Criteria limits.

Performance of the transmission system is measured against the WECC Reliability Criteria and the NERC Planning Standards. Table 5-2 illustrates the NERC/WECC Reliability Criteria. The reliability and performance criteria are applied to the entire WECC transmission system.

Table 5-2: WECC Disturbance-Performance Table of Allowable Effects on Other Systems
(In addition to NERC requirements)

NERC and WECC Categories	Outage Frequency Associated with the Performance Category (Outage/Year)	Transient Voltage Dip Standard	Minimum Transient Frequency Standard	Post-Transient Voltage Deviation Standard (See Note 2)
A	Not Applicable	Nothing in Addition to NERC		
B	≥ 0.33	Not to exceed **25%** at load buses or **30%** at non-load buses. Not to exceed **20% for more than 20 cycles** at load buses.	Not below **59.6 Hz** for 6 cycles or more at a load bus	Not to exceed **5%** at any bus
C	0.033 – 0.33	Not to exceed 30% at any bus. Not to exceed **20% for more than 40 cycles** at load buses.	Not below **59.0 Hz** for 6 cycles or more at a load bus	Not to exceed **10%** at any bus
D	< 0.033	Nothing in Addition to NERC		

Note 2: As an example in applying the WECC Disturbance-Performance Table, Category B disturbance in one system shall not cause a transient voltage dip in another system that is greater than 20% for more than 20 cycles at load buses, or exceed 25% at load buses or 30% at non-load buses at any time other than during the fault.

5.4 Post-Transient Voltage Stability Criteria

The last column of the above Table 5-2 illustrates the Post-Transient Voltage Stability Criteria. For some large generator contingencies, the governor power flow was utilized to test for the post-transient voltage deviation criteria.

5.5 Reactive Margin Criteria

Table 5-3 summarizes the voltage support and reactive power criteria in the NERC/WECC Planning Standards. The system performance was be evaluated according to the NERC/WECC planning criteria.

Table 5-3: Reactive Margin Analysis Criteria Summary

Performance Level/Category	Disturbance	Reactive Power Deficiency Criteria
B	Generator One Circuit One Transformer DC Single Pole Block	Governor power flow to reach convergence at 105% of load level or operational transfer capability
C	Two Generators Two Circuits DC Bipolar Block	Governor power flow to reach convergence at 102.5% of load level or operational transfer capability

5.6 Power Factor Criteria

Table 5-4 summarizes the power factor criteria per the CAISO tariff. The voltage at the POI must be within criteria under normal and contingency conditions.

Table 5-4: Power Factor Analysis Criteria Summary

Generation Type	Power Factor Criteria
Asynchronous Generator	0.95 lagging to 0.95 leading at the POI[2].
All other Generator Types	0.90 lagging to 0.95 leading at Generator terminals

5.7 Reactive Power Deficiency Analysis

A reactive power deficiency (adequacy) analysis was performed in the cluster Phase II study to determine the need and justification for instituting 0.95 leading/lagging power factor requirement at Point of Interconnection for asynchronous generating facilities.

The analysis was performed in two steps. First, the reactive power performance of the cluster will be assessed by modeling the asynchronous generating facilities modeled with unity power factor. Second, based on the results of step one, the study was performed with 0.95 lagging and leading power factor. The second step was perform to verify if 0.95 power factor was an effective partial or full mitigation measure to rectify the identified reactive power performance problem.

The normal condition and the CAISO Category “B” and “C” contingencies will be analyzed. The study will be performed for both pre and post project additions and the results will determine:

- Whether the addition of the project(s) causes normal condition voltages out of the allowable normal min/max range.

[2] The CAISO Tariff requires that projects be able to meet power factor requirements of 0.95 lagging and 0.95 leading at the POI, if studies identify the need based on meeting reliability and safety requirements.

- Whether the addition of the project(s) causes post-contingency voltages out of the allowable post-transient min/max range.
- Whether the addition of the project(s) causes excessive voltage deviation from the pre-contingency level.

6. Deliverability Assessment

The Deliverability Assessment was performed by the CAISO according to the On-Peak and Off-Peak Deliverability Assessment Methodologies posted on the CAISO website at: **http://www.caiso.com/1c44/1c44b5c31cce0.html**.

This assessment was done for generation projects that requested Full Capacity status only. Generation projects requesting Energy Only status were modeled with zero (0) MW output in the Deliverability Assessment base cases. During the summer peak, the dispatch for solar thermal or solar PV projects was assumed to be able to reach 100% of the nameplate capacity. The starting dispatch for wind projects was modeled according to historical output of the units in the same area during summer peak conditions. Table 6-1 lists the Full Capacity projects with their corresponding On-Peak dispatch levels. The Deliverability Assessment also analyzed an Off-Peak scenario, in which the wind generators were dispatched at 100% of the maximum generation output. All types of solar generators were dispatched at 85% of their maximum generation output.

Table 6-1: Deliverability Assessment (On-Peak) - Full Capacity Projects

CAISO Queue	Point of Interconnection	Full Capacity Energy Only	Fuel	Max MW	Pgen MW
495	Melones-Riverbank 115 kV Line	FC	Hydro	7.2	7.2
			Subtotal Full Capacity Hydro	**7.2**	7.2
586	Geysers #17-Fulton 230 kV Line	FC	Geothermal	49.9	49.9
			Subtotal Full Capacity Geothermal	**49.9**	49.9
489	Birds Landing Switching Station	FC	Wind	98.9	50.4
554	Carberry 230 kV Switching Station	FC	Wind	135	68.9
			Subtotal Full Capacity Wind	**233.9**	**119.3**
568	Eastshore Substation 230 kV bus	FC	Natural Gas	25	25
569	Table Mountain-Tesla 500 kV Line	FC	Natural Gas	600	600
606	Schulte 15 kV Switching Station	FC	Natural Gas	20	20
			Subtotal Full Capacity Natural Gas	**645**	**645**
			Total Deliverability Assessment Generation	**936**	**821.4**

6.1 Results

The Deliverability Assessment results for Category A, B and C contingencies are provided in detail under Appendix C.

6.2 Operational Deliverability Assessment

The CAISO tariff allows a Generating Facility to interconnect to the CAISO controlled-grid as an Energy-Only resource on an interim-only basis before all the required Delivery Network Upgrades are in service. In the Phase II study, CAISO performed the operational deliverability assessment to provide information on the interim deliverability for the Phase II projects that request Full Capacity deliverability. Such interim and partial deliverability assessment is for information only.

The operational deliverability assessment follows the same on-peak deliverability assessment methodology as described in Section 6. The key components of the operational deliverability assessments are discussed below.

Study Years

The assessment for the PG&E North Area Group was performed for 2013. For 2014, all new generation and network upgrade assumptions are same as in the main study.

Assumptions for Generation Interconnection Projects

The Phase II projects and generation projects queued ahead of Cluster 1 and Cluster 2 are modeled in the operational deliverability assessment according to the latest Commercial Operation Date (COD) information available. A project is modeled in a study year if the COD of the project is before the summer of the study year. The projects not listed in Table 6-2 have COD later than 2014 summer.

Table 6-2: Generation Projects in the PG&E North Area Group Modeled in the Operational Deliverability Assessment

Queue Position	PMAX	Point of Interconnection	First Operational Deliverability Study Year
489	98.9	Birds Landing Substation 230kV	2014
495	7.2	Tulloch 115kV tap	2012
554	138	Carberry Switching Station 230 kV	2013
568	25	Eastshore Substation 230kV Bus	2012
569	600	Table Mountain-Tesla 500kV	2013
586	49.9	Geysers #17-Fulton 230kV	2013 *(Note 3)*
606	20	Schulte Switching Station 115kV bus	2012
642	20	Elk Creek 60kV Tap	2012
649A	14	Dixon-Vaca #2 60kV	2013
651	20	Nicolaus-Marysville 60kV	2012
653F	12	Woodland-Davis 115 kV	2012

Note 3: The IC indicated at the project's Results Meeting, a Commercial Operation Date (COD) change from the studied COD to January 1, 2015.

Assumptions for Transmission Upgrades

Transmission upgrades are modeled in the operational deliverability assessment based on their estimated COD. A transmission upgrade is modeled in a study year if the estimated COD is before the summer of the study year. All the required SPSs are assumed to be in-service when the associated generation project is in commercial operation.

Table 6-3 Transmission Upgrades in the PG&E North Area Group Modeled in the Operational Deliverability Assessment

Transmission Upgrade	First Operational Deliverability Study Year
Re-conductor the Rio Dell 60 kV tap line	2014
Reconductor East Shore - San Mateo #1 230 kV Line	2013
Re-conductor East Shore - Dumbarton 115 kV line	2013
Replace East Shore 230/115 kV bank 2	2013
Contra Costa PP – Delta Pumps 230 kV Line Reconductoring	2013
Kelso – Tesla 230 kV Line Reconductor	2012
Las Positas – Newark 230 kV Line Reconductoring	2012
Carberry Switching Station-Round Mountain 230 kV	2014
Los Banos-Q577 230 kV Reconductor	2014
Pittsburg – Tesla 230 kV Reconductoring	2014
Contra Costa – Moraga 230 kV Line Reconductoring	2013
Missouri Flat - Gold Hill 115 kV Line	2014
Rio Oso 230/115 kV Transformer Upgrades	2013
Ignacio-San Rafael (Ignacio – San Rafael and Ignacio – Las Gallinas 115 kV Reconductoring)	2013
Maple Creek Reactive Support	2013
Fulton-Fitch Mountain 60 kV Line Reconductor	2013
Glenn #1 60 kV Reconductoring	2013
Humboldt 115/60 kV Transformer Replacements	2013
Mare Island - Ignacio 115 kV Reconductoring Project	2013
Morro Bay 230/115 kV Transformer Addition Project	2013
Mountain View/Whisman-Monta Vista 115 kV Reconductoring	2014
Weber 230/60 kV Transformer Nos. 2 and 2A Replacement	2013
West Point - Valley Springs 60 kV Line Project	2013
Vierra 115 kV Looping Project	2014

Transmission Upgrade	First Operational Deliverability Study Year
Stagg - Hammer 60 kV Line	2014
South of Palermo 115 kV Reinforcement Project	2014
Moraga-Castro Valley 230 kV Line Capacity Increase Project	2013
Mesa-Sisquoc 115 kV Line Reconductoring	2014
Lemoore 70 kV Disconnect Switches Replacement	2013
Hammer - Country Club 60 kV Switch Replacement	2012
Jefferson-Stanford #2 60 kV Line	2014
Fulton 230/115 kV Transformer	2014
Cayucos 70 kV Shunt Capacitor	2014
Cortina No.3 60 kV Line Reconductoring Project	2013
Cascade 115/60 kV No.2 Transformer Project and Cascade - Benton 60 kV Line Project	2014

Method for Determining Deliverable Partial Capacity

Assuming the system conditions cannot accommodate the full deliverability of all generators in the study area that will be in commercial operation for the study year, the partial deliverability of each generator is determined from the amount of its power output that can be accommodated on a portion of the transmission constraint that is binding in the deliverability power flow. For each generator, the portion of the binding transmission constraint is calculated as a function of the queue position, generator's size and its flow impact on the constraint.

For each deliverability constraint facility, the available capacity without the generation projects being tested is allocated to projects in the order from higher queued projects to lower queued projects until it is there is no more capacity left. The projects in the same cluster are considered to have the same queue position. If there is available partial capacity for projects in the same cluster, each project's partial deliverability capacity is determined based on the generator's size and its flow impact.

Results of the operational deliverability assessment for the PG&E North Area Group under the study assumptions described above, if applicable, are included in the individual report of each full-capacity project.

7. Steady State Assessment

This assessment is comprised of Power Flow Analysis and Reactive Power Deficiency Analysis.

7.1 Power Flow Analysis

Power flow analyses were performed to ensure that PG&E's transmission system remains in full compliance with NERC reliability standards TPL-001, 002, 003 and 004 with the proposed interconnection. The results of these power flow analyses will serve as documentation that an evaluation of the reliability impact of new facilities and their connections on interconnected transmission systems is performed. If a NERC reliability problem exists as a result of this interconnection, it is PG&E's responsibility to identify the problem and develop an appropriate corrective action plan to comply with NERC reliability standards.

As part of PG&E's obligations with NERC as the registered Transmission Owner for the PG&E transmission system, the study results for this interconnection will be communicated to the CAISO, or other neighboring entities that may be impacted, for coordination and incorporation of its transmission assessments. Input from the CAISO and other neighboring entities are solicited to ensure coordination of transmission systems.

Three (3) power flow base cases were used to evaluate the transmission system impacts of the C1C2 projects. While it is impractical to study all combinations of system load and generation levels during all seasons and at all times of the day, these two base cases represented extreme loading and generation conditions for the study area.

The CAISO and PG&E cannot guarantee that the C1C2 projects:

a) can operate at maximum rated output 24 hours a day, year round, without adverse system impacts; nor

b) will not have adverse system impacts during the times and seasons not studied in the Phase I Study.

The following power flow base cases were used for the analysis in the C1C2 Phase II Study:

- **2014 Summer Peak Full Loop Base Case (4020 COI / 90% Hydro):**

  Power flow analyses were performed using PG&E's 2014 summer peak full loop base case (in General Electric Power Flow format). This base case was developed from 2010 base case series. It has a 1-in-10 year adverse weather load level for North area. Furthermore, COI was assumed to be in the north to south direction at a flow of around 4,020 MW, with a hydro generation dispatch at 90%.

- **2014 Summer Peak Full Loop Base Case (4800 COI / 70% Hydro):**

  Power flow analyses were also performed using PG&E's 2014 summer peak full loop base case with COI assumed to be in the north to south direction at a flow of around 4,800 MW. Furthermore, hydro generation dispatch was assumed to be at 70% for the North Area.

- **2014 Spring Off-Peak Full Loop Base Case:**

  Power flow analyses were also performed using PG&E's 2014 spring off-peak full loop base case. This base case assumes that reduced load levels for the North Area which is representative of a typical spring off-peak day. This case is used to evaluate the potential transmission congestions caused by delivering power from local generation when the system is experiencing high hydro generation dispatch.

These base cases modeled all CAISO approved PG&E transmission projects that would be operational by 2014. The base cases also modeled all proposed generation projects that were higher than the C1C2 projects in the CAISO Generation Interconnection Queue. In addition to the CAISO Queue, the study also took into account the planned generating facilities in PG&E's service territory that are ahead of this Project in PG&E's Generation Interconnection Queue. This includes the PG&E Wholesale Distribution Tariff and Transmission Owner Tariff planned generating facilities.

These generation projects were modeled along with their identified transmission upgrades necessary for their interconnection and/or delivery. However, some generation projects that are electrically far from the C1C2 projects were either turned off or modeled with reduced generation to balance the loads and resources in the power flow model.

7.2 Reactive Power Deficiency Analysis

Reactive Power Deficiency Analysis indicated that the North C1C2 Group projects did cause the PG&E system to fail to meet applicable voltage criteria.

Substation Name	Contingency Description	Pre-Project Voltage V (PU)	Post-Project Voltage V (PU)	Mitigation	Base Case	Category
Elk Creek 60 kV	Normal	1.043	1.099	Maintain PF = -0.95 at POI for S0642, and 5 MVAr reactor at the S0642 Switching Station 60 KV	Spring off-peak	Category A
Elk Creek 60 kV	Glenn-Delevan 230 kV Line	1.046	1.103	Maintain PF = -0.95 at POI for S0642, and 5 MVAr reactor at the S0642 Switching Station 60 KV	Spring off-peak	Category B
Elk Creek Jct 60 kV	Normal	1.044	1.066	Maintain PF = -0.95 at POI for S0642, and 5 MVAr reactor at the S0642 Switching Station 60 KV	Spring off-peak	Category A

7.3 Study Results

The overloads caused by the PG&E North Area Group C1C2 projects and associated power flow plots are shown in Appendix D. The worst overloads for each facility are summarized in Tables 7-1 and 7-2. The full list of power flow results are shown in Appendix G and Appendix H.

7.3.1 Normal Overloads (Category "A")

Under projected 2014 summer peak and spring off-peak conditions, the North Area C1C2 Group projects caused two (2) new Category "A" normal overloads. The worst Category "A" normal overloads are summarized in Table 7-1.

Table 7-1: Summer Peak and Spring Off-Peak Category "A" Normal overloads

Over Loaded Component	Rating (MVA)	Pre- Project Loading (Per Unit)	Post-Project Loading (Per Unit)	Delta	Mitigation
Category "A" Normal Overloads - 2014 Summer Peak (4800 COI / Hydro 70%)					
Contra Costa PP – Contra Costa Sub 230 kV Line	637.4	0.98	**1.02**	0.04	Upgrade Limiting Equipment
Category "A" Normal Overloads - 2014 Spring Off-Peak					
Carberry Sw Sta – Round Mountain 230 kV Line	244.0	0.79	**1.26**	0.46	Reconductor

7.3.2 Emergency Overloads (Category "B" and "C")

Under projected 2014 summer peak and spring off-peak conditions, the North Area C1C2 Group projects caused four (4) new Category "B" and "C" emergency overloads. The worst Category "B" and "C" overloads are summarized in Table 7-2.

Table 7-2: Summer Peak and Spring Off-Peak, Category "B" and "C" Emergency Overloads

Over Loaded Component	Contingency	Rating (MVA)	Pre- Project Loading (Per Unit)	Post-Project Loading (Per Unit)	Delta	Mitigation
Category "B" Emergency Overloads - 2014 Summer Peak (4800 COI / Hydro 70%)						
Contra Costa – Brentwood 230 kV Line	Contra Costa – Delta Switching Yard 230 kV Line	419.5	0.96	**1.00**	0.04	SPS to trip Q489
Category "B" Emergency Overloads - 2014 Summer Peak (4020 COI / Hydro 90%)						
Pit #1 – Cottonwood 230 kV Line (Burney Forest Tap – Pit 1)	Carberry Sw Sta-Round Mountain 230 kV Line	239.0	0.95	**1.31**	0.37	SPS to trip C0554, adding to existing Hatchet Ridge SPS
Pit #1 – Cottonwood 230 kV Line (Cottonwood - Burney Forest Tap)	Carberry Sw Sta-Round Mountain 230 kV Line	279.3	0.89	**1.20**	0.31	SPS to trip C0554, adding to existing Hatchet Ridge SPS
Category "B" Emergency Overloads - 2014 Spring Off-Peak						
Pit #1 – Pit #3 230 kV Line (Pit #1 – SPI Burney)	Carberry Sw Sta-Round Mountain 230 kV Line	280.0	0.63	**1.11**	0.48	SPS to trip C0554, adding to existing Hatchet Ridge SPS
Pit #1 – Pit #3 230 kV Line (SPI Burney – Pit #3)	Carberry Sw Sta-Round Mountain 230 kV Line	280.0	0.58	**1.06**	0.48	SPS to trip C0554, adding to existing Hatchet Ridge SPS
Category "C" Emergency Overloads - 2014 Spring Off-Peak						
Round Mountain 500/230 kV Bank 1	Malin-Round Mountain #1 and #2 500 kV DLO	1122.0	0.94	**1.02**	0.08	SPS to trip Q554/ PG&E to investigate the use of emergency rating.

8. Short Circuit Duty Assessment

Short circuit studies were performed to determine the impact of adding the North C1C2 projects to the transmission system. These studies are also needed to perform relay coordination among adjacent substations. The fault duties were calculated before and after the C1C2 projects to identify any equipment overstress conditions. The fault duties were calculated once again after mitigation plan was added in the base case.

Three line-to-ground (3LG) and single line-to-ground (SLG) faults were simulated without the C1C2 projects, with C1C2 projects, and with C1C2 projects plus mitigation plan.

The responsibility to finance short circuit related Reliability Network Upgrades identified through a Group Study are assigned to all Interconnection Requests in that Group Study pro rata on the basis of short-circuit duty contribution of each Generating Facility. In addition, the short circuit duty impact of the associated proposed Network Upgrades are allocated to each Generating Facility using the same percentage assigned for the triggered Network Upgrade. The pro rata contribution corresponding to each C1C2 project is provided in each individual report (Appendix A).

8.1 Results

The available short circuit duty at the buses electrically adjacent to the North Area C1C2 Group projects is listed (highlighted in bold) in Appendix F. These results indicate that the following circuit breakers were overstressed due to the North Area C1C2 Group projects and need to be mitigated:

- Three (3) 525 kV circuit breakers at Tesla Substation

These identified overstressed circuit breakers will be mitigated by replacement with higher rated circuit breakers at each location.

9. Transient Stability Analysis

Transient stability analysis was conducted using the 2014 summer peak full loop base cases to ensure that the transmission system remains in operating equilibrium, as well as operating in a coordinated fashion through abnormal operating conditions after C1C2 projects begin operation. The generator dynamic data used for the study is confidential in nature and is provided with each individual project report.

9.1 Transient Stability Study Scenarios

Disturbance simulations were performed for a study period of 10 seconds to determine whether the PG&E North Area Group C1C2 projects will create any system instability during a variety of line and generator outages. For each Project, selected line and generator outages in the vicinity of that project were evaluated. The outages were consistent with Category B and Category C requirements (single element and multiple element outages).

9.2 Parameters Monitored to Evaluate System Stability Performance

This information is provided in the project reports (Appendix A).

9.2.1 Rotor Angle

The rotor angle plots provide a measure for determining how the proposed generation units would swing with respect to one another. The plots also provide a measure of how the units would swing with respect to other generation units in the area.

9.2.2 Bus Voltage

The bus voltage plots, in conjunction with the relative rotor angle plots, provide a means of detecting out-of-step conditions. The bus voltage plots are useful in assessing the magnitude and the duration of post disturbance voltage dips and peak-to-peak voltage oscillations. The bus voltage plots also give an indication of system damping and the level to which voltages are expected to recover in steady state conditions.

9.2.3 Bus Frequency

The bus frequency plots provide information on the magnitude and the duration of post fault frequency swings with the Project in service. These plots indicate the extent of possible over-frequency or under-frequency, which can occur because of the imbalance between the generation and load within an area.

9.2.4 Other Parameters

The following parameters can also be monitored when required:

- Generator Terminal Power
- Generator Terminal Voltage
- Generator Rotor Speed
- Generator Field Voltage
- Bus Angle
- Line Flow
- Voltage Spread
- Frequency Spread

9.3 Results

The study concluded that one C1C2 Group project could exacerbate pre-existing transmission system instability concerns under the following Category "B" and Category "C" outage conditions:

Category "B" Contingency

- Tesla – Q569 500 kV Line outage
- Table Mountain – Q569 500 kV Line outage

Category "C" Contingency

- Loss of Q569 500 kV bus

Therefore, the C1C2 Group is not required to mitigate these pre-existing problems. The results of the study are provided in the form of plots in the project individual reports (Appendix A).

10. Reactive Power Deficiency Analysis

The power flow studies of Category “A”, Category “B” and Category “C” contingencies indicate that the C1C2 projects did cause voltage drops of 5% or more from the pre-project levels, or cause the PG&E system to fail to meet applicable voltage criteria. See Section 7.2 for more details.

11. Mitigation of Overloaded Facilities

Depending on the category of contingencies that cause the overloads and conditions of the overloads, several methods can be used to as mitigation plans. For example, one plan is to reconductor the overloaded transmission lines with higher capacity conductors. A Special Protection Scheme (SPS) can be used to mitigate overloads under contingency conditions as long as it complies with the planning standards and SPS guidelines. In some cases, congestion management may be used depending upon the conditions of the overloads.

For CAISO Category “C” contingencies, the overloads may be mitigated by generation dropping as allowed under NERC/WECC reliability criteria. PG&E or CAISO or both may require new generators to take part in and be responsible for the costs of operating procedures and/or SPS for Category “C” overloads caused by the C1C2 projects. Only new Category “C” overload mitigation will be provided in this report.

11.1 Mitigation for Category “A” Normal Overloads

11.1.1 Contra Costa PP – Contra Costa Sub 230 kV Line

Solution: Upgrade limiting equipment (line disconnect switches)

Cost: $250,000

11.1.2 Carberry Switching Station – Round Mountain 230 kV Line

Solution: Reconductor approximately 13 miles of the 230 kV transmission line to a higher capacity conductor. Substation terminal equipment will also be upgraded to match or exceed the ampacity ratings of the new conductors.

Cost: $17.2 million

11.2 Mitigation for Category “B” and “C” Overloads

11.2.1 Contra Costa – Brentwood 230 kV Line

Solution: Install SPS to trip Q489

Cost: $2.5 million

11.2.2 Pit #1 – Cottonwood 230 kV Line

Solution: Install SPS to trip Q554 (adding to existing Hatchet Ridge SPS)

Cost: $2.5 million

11.2.3 Pit #1 – Pit #3 230 kV Line

Solution: Install SPS to trip Q554 (adding to existing Hatchet Ridge SPS)

Cost: $2.5 million

11.2.4 Round Mountain 500/230 kV Bank #1

Solution: Install SPS to trip Q554 (adding to existing Hatchet Ridge SPS)

Cost: $1.5 million

11.3 Mitigation for Reactive Power Deficiency

Reactive Power Deficiency Analysis indicated that the North C1C2 Group projects did cause the PG&E system to fail to meet applicable voltage criteria.

Solution: Install 5 MVAr reactor at Q642 Switching Station

Cost: $3.0 million

11.4 Mitigation for Transient Stability Issues

The study concluded that Q569 could exacerbate pre-existing transmission system instability under Category "B" and Category "C" outage conditions. Therefore, the Q569 project is not required to mitigate these pre-existing problems.

11.5 Mitigation for Fault Duty

Solution: Replace overstressed circuit breakers at the following substations:

- Three (3) 525 kV circuit breakers at Tesla Substation

Cost: $9.0 million

12. Environmental Evaluation / Permitting

12.1 CPUC General Order 131-D

PG&E is subject to the jurisdiction of the California Public Utilities Commission (CPUC) and must comply with CPUC General Order 131-D (Order) on the construction, modification, alteration, or addition of all electric transmission facilities (i.e., lines, substations, switchyards, etc.). This includes facilities to be constructed by others and deeded to PG&E. In most cases where PG&E's electric facilities are under 200 kV and are part of a larger project (i.e., electric generation plant), the Order exempts PG&E from obtaining an approval from the CPUC provided its planned facilities have been included in the larger project's California Environmental Quality Act (CEQA) review, the review has included circulation with the State Clearinghouse, and the project's lead agency (i.e., California Energy Commission) finds no significant unavoidable environmental impacts. PG&E or the project developer may proceed with construction once PG&E has filed notice with the CPUC and the public on the project's exempt status, and the public has had a chance to protest PG&E's claim of exemption. If PG&E facilities are not included in the larger project's CEQA review, or if the project does not qualify for the exemption, PG&E may need to seek approval from the CPUC (i.e., Permit to Construct) taking as much as 18 months or more since the CPUC would need to conduct its own environmental evaluation (i.e., Negative Declaration or Environmental Impact Report).

When PG&E's transmission lines are designed for immediate or eventual operation at 200 kV or more, the Order requires PG&E to obtain a Certificate of Public Convenience and Necessity (CPCN) from the CPUC unless one of the following exemptions applies: the replacement of existing power line facilities or supporting structures with equivalent facilities or structures, the minor relocation of existing facilities, the conversion of existing overhead lines (greater than 200 kV) to underground, or the placing of new or additional conductors, insulators, or their accessories on or replacement of supporting structures already built. Obtaining a CPCN can take as much as 18 months or more if the CPUC needs to conduct its own CEQA review, while a CPCN with the environmental review already done takes only 4-6 months or less.

Regardless of the voltage of PG&E's interconnection facilities, PG&E recommends that the project proponent include those facilities in its project description and application to the lead agency performing CEQA review on the project. The lead agency must consider the environmental impacts of the interconnection electric facility, whether built by the developer with the intent to transfer ownership to PG&E or to be built and owned by PG&E directly. If the lead agency makes a finding of no significant unavoidable environmental impacts from construction of substation or under-200 kV power line facilities, PG&E may be able to file an Advice Letter with the CPUC and publish public notice of the proposed construction of the facilities. The noticing process takes about 90 days if no protests are filed, but should be done as early as possible so that a protest does not delay construction. PG&E has no control over the time it takes the CPUC to respond when issues arise. If the protest is granted, PG&E may then need to apply for a formal permit to construct the project (i.e., Permit to Construct). Facilities built under this procedure must also be designed to include consideration of electric and magnetic field (EMF) mitigation measures pursuant to PG&E "EMF Design Guidelines for New Electrical Facilities: Transmission, Substation and Distribution". For projects that are not eligible for the Advice Letter/notice process but have already undergone CEQA review, PG&E would likely be able to file a "short-form" CPCN or PTC application, which takes about 4-6 months to process.

Please see Section III, in General Order 131-D. This document can be found in the CPUC's web page at:

http://www.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/589.htm

12.2 CPUC Section 851

Because PG&E is subject to the jurisdiction of the CPUC, it must also comply with Public Utilities Code Section 851. Among other things, this code provision requires PG&E to obtain CPUC approval of leases and licenses to use PG&E property, including rights-of-way granted to third parties for Interconnection Facilities. Obtaining CPUC approval for a Section 851 application can take several months, and requires compliance with CEQA. PG&E recommends that Section 851 issues be identified as early as possible so that the necessary application can be prepared and processed. As with GO 131-D compliance, PG&E recommends that the project proponent include any facilities that may be affected by Section 851 in the lead agency CEQA review so that the CPUC does not need to undertake additional CEQA review in connection with its Section 851 approval.

13. Upgrades, Cost and Time to Construct Estimates

The cost estimates are based on the published unit costs, when applicable. Customized costs were developed when the unit costs did not reflect the unique circumstances of a project. The customized costs include: anticipated purchase of land rights, licensing, environmental mitigation, looping lines into substations, new switchyards, substation upgrades not included in unit costs, and PTO's Interconnection Facilities.

The Commercial Operation Dates of the generation projects in the Cluster 1/Cluster 2 Phase II study are dependent on the completed construction and energizing of the identified Network Upgrades. Without these upgrades, the new generators may be subject to CAISO's congestion management, including generation tripping. Based on the needed time for permitting, design, and construction, it may not be feasible to complete all the upgrades needed for this cluster before the requested Commercial Operation Dates.

Costs for each generation project are confidential and are not published in the main body of this report. Each IC is receiving a separate report, specific only to that generation project, containing the details of the IC's cost responsibilities.

The estimated cost of **Reliability Network Upgrades** identified in this Group Study is assigned to all Interconnection Requests in that Group Study according to the following rules: (a) short circuit related Reliability Network Upgrades will be assigned pro rata on the basis of the short circuit duty contribution of each Large Generating Facility, (b) for all other Reliability Network Upgrades, the cost will be assigned pro rata on the basis of the maximum megawatt electrical output of each proposed new Large Generating Facility or the amount of megawatt increase in the generating capacity of each existing Generating Facility as listed by the Interconnection Customer in its Interconnection Request.

The estimated cost of all **Delivery Network Upgrades** identified in the Deliverability Assessment are assigned to all Interconnection Requests selecting Full Capacity Deliverability Status based on the flow impact of each such Large Generating Facility on the Delivery Network Upgrades as determined by the generation distribution factor methodology.

The estimated cost of all **Interconnection Facilities** is assigned to each Interconnection Request individually. The cost estimates for the Interconnection Facilities are all site specific and details are provided in each individual project report.

The estimated cost of Distribution Upgrades is developed by the PTOs and is not mandated by CAISO tariff. The developer should negotiate with the PTOs on any issues related to this cost.

The total cost of the CAISO mitigation plan on the PG&E system is **$58.45 million** as shown in Table 13-1.

Table 13-1: Upgrades, Estimated Costs, and Estimated Time to Construct Summary

Type of Upgrade	Upgrade	Description	Estimated Cost (x 1,000)	Estimated Time to Construct
Delivery Network Upgrades	Contra Costa PP – Contra Costa Sub 230 kV Line	• Upgrade limiting equipment (i.e. line disconnect switch)	$250	12-18 Months
	Carberry Switching Station – Round Mt. 230 kV Line	• Reconductor approx. 13 miles to a higher capacity conductor	$17,200	36-48 Months
Reliability Network Upgrades	Contra Costa – Brentwood 230 kV Line	• Implement SPS to trip Q489 under emergency line loading conditions	$2,500	24-36 Months
	Pit #1 – Pit #3 230 kV Line	• Implement SPS to an existing SPS at Hatcher Ridge to trip Q554 under emergency line loading conditions	$2,500	24-36 Months
	Round Mountain 500/230 kV Bank #1	• SPS to trip Q554 (added to existing RAS)	$1,500	24-36 Months
	Pit #1 – Cottonwood 230 kV Line	• Implement SPS to an existing SPS at Hatcher Ridge to trip Q554 under emergency line loading conditions	$2,500	24-36 Months
	Overstressed Circuit Breakers	• Replace three (3) 525 kV circuit breakers • CB 542, CB 632, CB 642	$9,000	36-48 Months
	500 kV Series Capacitors	• Installation of approx. 15 ohm series capacitors on at the new 500 kV switching station	$20,000	24-36 Months
	Reactive Power Deficiencies (Voltage Violations)	• 5 MVAr (reactor) at the Q642 Switching Station	$3,000	24-36 Months
		Total PG&E Reliability Network Upgrades Cost	**$41,000**	
		Total PG&E Delivery Network Upgrades Cost	**$17,450**	
		Total Allocated Cost for PG&E's North Group	**$58,450**	

The non-binding construction schedule to engineer and construct the facilities identified in this report will be project-specific and will be based upon the assumption that the environmental permitting obtained by the IC is adequate for permitting all PG&E activities.

It is assumed that the IC will include the PG&E Interconnection Facilities and Network Upgrades work scope, as they apply to work within public domains, in its environmental impact report to the CPUC. However, note that CPUC may still require PG&E to obtain a PTC or a CPCN for the generator tie line and Network Upgrades work associated with the Project. Hence, the facilities needed for the project interconnection could require an additional two to three years to complete. The cost for obtaining any of this type of permitting is not included in the estimates.

Notes (3 through 6) associated with the estimated costs in Table 13-1 are as follows:

Note 4 – General comments for Construction Schedules:

The schedule provided is the estimated schedule for PG&E to complete only the construction activities for the specified facility.

The construction schedule is based upon the assumption that the environmental permitting obtained by the IC is adequate for permitting all PG&E activities. This includes only the time required to obtain permits anticipated in Section 12.1. Additional permits required beyond those anticipated will impact the Project's schedule.

Note that if CPUC requires PG&E to obtain a Permit to Construct (PTC) or a Certificate of Public Convenience and Necessity (CPCN) for any work associated with the Project, the Project could require an additional two to three years to complete. The cost for obtaining any of this type of permitting is not included in the above estimates.

Note 5 – Potential Impacts to Construction Schedules

ICs should be aware that clearances to interconnect generation projects in various parts of the PG&E service territory that are not completed by April are likely be delayed until November or later due to clearance limitations.

In addition, the estimated construction schedule does not take into account the following circumstances which can impact the implementation schedules:

i. unanticipated delays or difficulties securing necessary permits, licenses or other approvals;

ii. construction difficulties or potential delays in the project implementation process; or

iii. unanticipated delays or difficulties in obtaining and receiving necessary clearances for interconnection of the project to the transmission system.

Note 6 – General comments for Reconductoring:

The reconductoring estimates assume that there is no need for additional right-of-way and assume the upgrades are exempt from licensing.

Note 7 – SPS Classification:

All Special Protection Systems are classified as Reliability Network Upgrades. This is to prevent overburdening of CAISO's congestion management system which can increase processing time to a point that could create reliability concerns.

Presently, PG&E uses a Remedial Action Scheme (RAS) that trips CDWR pumps, generation and /or load, and bypasses series capacitors during certain contingencies to maintain the transfer capability of its transmission system. These contingencies include transmission line outages on the California-Oregon Intertie (Path 66), Pacific DC Intertie (PDCI), and the Midway - Los Banos (Path 15).

Due to the various project locations, the generation facilities may be added to the existing 500 kV (Path 15) RAS or other special protection schemes, as necessary, to mitigate any adverse impacts on the system caused by the addition of the Project to the transmission system.

The SPS cost provided here covers the bulk of the PTO's SPS cost which is essentially a one time set up and equipment cost. It includes the equipment required on the PTO's system as well as the logic board that would be provided to the IC for installation at their project's substation. (Note: The SPS costs do not include installation costs at the project's substation or any work necessary within the generator project such as fiber-optic/communication/control lines that the IC needs to include as part of the gen-tie and to the trip points within their project.)

14. Coordination with Affected Systems

CAISO GIP tariff Appendix Y section 3.7 requires the CAISO to coordinate with any Affected Systems that may be potentially impacted by the C1C2 projects. The CAISO will notify the Affected Systems of the potential impacts and coordinate any studies required to determine the impact of the C1C2 projects on Affected Systems with Affected System Operators, and to the extent possible, the CAISO will include those results (if available) in its applicable Interconnection Study within the specified time frame.

Also, as part of PG&E's obligations to NERC as the registered Transmission Owner for the PG&E transmission system, the study results of this interconnection will be communicated to the neighboring entities that may be impacted for purposes of coordination and incorporation in the neighboring entity's transmission assessments. Input from the CAISO and other neighboring entities are solicited to ensure coordination of transmission systems.

In addition, the interconnection of the C1C2 projects should not adversely affect the ability of PG&E to honor its Encumbrances, including under the Owners Coordinated Operation Agreement (OCOA). For example, the OCOA requires avoidance of system changes that would adversely impact existing California/Oregon Intertie (COI) transfers; reduce the rated system transfer capability (RSTC) or available system transfer capacity (ASTC) of the Pacific AC Intertie between Malin and Tesla (PACI) and/or the California Oregon Transmission Project (COTP); or cause increased risk of curtailments of the PACI and/or COTP. Specifically as noted in Appendix E, and the results of dynamic stability studies described in this report, Projects Q554 and Q569 show the following incremental overloads (i.e., increases the pre-existing overload conditions), among other issues identified in this report:

- Round Mountain 500/230 kV bank

- Olinda 500/230 kV bank (Affected System: COTP)
- Cottonwood - Olinda 230 kV lines (Affected System: WAPA)

Pursuant to the CAISO's procedures, the CAISO will notify the Affected Systems of these impacts. Each IC identified above will be responsible to reach an agreement with each Affected System regarding a solution to ameliorate these identified impacts. The agreed-upon solution must avoid adversely impacting existing COI transfers, reducing the RSTC or ASTC of the PACI and/or COTP, or causing increased risk of curtailments of the PACI and/or COTP, and the solution may not rely upon curtailment of existing generation within the CAISO. The IC bears cost responsibility for the solutions. The CAISO will not release an IC for commercial operation until the IC has reached an agreement with each Affected System for appropriate solutions.

Likewise, for any C1C2 project that has initiated WECC path rating studies for COI, if these studies indicate system performance deficiencies that adversely affect maintaining the existing transfer levels at COI, PACI, or COTP, then it is the responsibility of the IC to mitigate the system performance deficiencies by curtailing of the output of the IC generation so that PG&E's OCOA Encumbrances are honored.

14.1 Maintenance of Encumbrances

Per CAISO Tariff Section 25.3, new generating facilities shall not adversely PG&E's ability to honor its existing Encumbrances. PG&E, in consultation with the CAISO, will identify any adverse effects on its Encumbrances in the interconnection studies. To the extent that PG&E determines that the interconnection of the new generating facility will have an adverse effect on Encumbrances on COI owners, the study results herein include mitigation for such adverse effect and some of these are discussed above.

14.2 Affected Systems

The study identified pre-existing transient stability issues that were exacerbated post project under certain Category "B" and Category "C" outage conditions, with the impacted transmission facilities found to be within the WAPA and COTP service territories. These concerns may require further investigation by the Affected Systems.

Appendix A – Q569

Calpine Corporation

Sutter Energy Center #2

Final Report

(Revision 1)

January 13, 2012

This study has been completed in coordination with Pacific Gas & Electric per CAISO Tariff Appendix Y Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window

Revision Summary

<u>This revision includes the following major changes/edits:</u>

- Reduce costs for the Transmission Line cost estimates based on IC clarification on Project Location and gen-tie length. Reduction in Network Upgrade cost estimate from $77.3 Million to **$62.7 Million**.

- Added supplemental info on the new 500 kV switching station

- Revised Transient Stability Results and Affected Systems Sections

Table of Contents

Attachments:

1. Executive Summary

Calpine Corporation, an Interconnection Customer (IC), has submitted a completed Interconnection Request (IR) to the California Independent System Operator Corporation (CAISO) for their proposed Sutter Energy Center #2 Project (Project). The maximum net output to the CAISO controlled-grid will be 600 MW. The Project will be interconnected to the Pacific Gas and Electric Company's (PG&E's) Table Mountain – Tesla 500 kV Line in Sutter County, California. The proposed Commercial Operation Date (COD) of the Project is May 1, 2013[1].

In accordance with Federal Energy Regulatory Commission (FERC) approved Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window (CAISO Appendix Y), this project was grouped with "North Group" projects (Cluster 1/Cluster 2 Phase II Study) to determine the impacts of the group as well as impacts of this Project on the CAISO controlled-grid.

The group report has been prepared separately identifying the combined impacts of all projects in the group on the CAISO controlled-grid. This report focuses only on the impacts of this Project.

The report provides the following:

1. Transmission system impacts caused by the Project,

2. System reinforcements necessary to mitigate the adverse impacts caused by the Project under various system conditions, and

3. A list of required facilities with a maximum cost responsibility for Network Upgrades assigned to this Project and a non-binding, good faith estimate of the Interconnection Facilities cost and time to construct these facilities.

The Phase II study results have determined that the Project is not responsible for any delivery network upgrades for the mitigation of any transmission facility overloads within the PTO system. Furthermore, study results concluded that the Project does not cause any voltage violations or reactive power deficiencies.

However, short circuit studies identified three (3) overstressed 525 kV circuit breakers at the Tesla Substation. In addition, in the post project case the dynamic stability results indicated that the transmission system's transient performance could exacerbate pre-existing stability concerns following selected disturbances.

The non-binding cost estimate of Interconnection Facilities[2] to interconnect the Project is approximately **$541,000**, exclusive of ITCC[3]. The maximum cost

[1] The IC indicated at the project's Results Meeting, a COD change from the studied COD to January 1, 2015.
[2] The transmission facilities necessary to physically and electrically interconnect the Project to the CAISO controlled grid at the point of interconnection.
[3] Income Tax Component of Contribution

responsibility for the PG&E North Area Network Upgrades[4] to interconnect the Project is **$62.47 Million**.

The non-binding construction schedule to engineer and construct the facilities is approximately 36-48 months from the signing of the Generator Interconnection Agreement (GIA).

The Q0569 project Interconnection Customer (IC) must be aware of the potential Subsynchronous Resonance (SSR) and Single Pole Tripping (High speed reclosing on a single pole tripping) issues when interconnecting generation near series compensation. The IC will assume all responsibility for any damage to their equipment. The IC is also solely responsible for any determination of possible SSR interactions, single pole tripping requirements and counter measures.

2. Project and Interconnection Information

Table 2-1 provides general information about the Project, as provided in the IR.

Table 2-1: Project General Information

Project Location	Sutter County, California
Number and Type of Generators	Two (2) gas turbines and one (1) steam turbine (Combined Cycle Configuration)
Maximum Generator Output	612 MW
Generator Auxiliary Load	12 MW
Maximum Net Output to Grid	600 MW
Power Factor Range	0.85 lagging to 0.95 leading[5]
Step-up Transformer	Three-phase transformers: One 500/230 kV, rated 775 MVA, and three 18/230 kV, rated 235 MVA.
Point of Interconnection	Table Mountain – Tesla 500 kV Line (Loop-in)
Interconnection Voltage	500 kV
Commercial Operation Date	5/1/2013

Figure 2-1 provides the map for the Project and the transmission facilities in the vicinity. Figure 2-2 shows the conceptual single line diagram of the Project.

[4] The transmission facilities other than Interconnection Facilities beyond the point of interconnection necessary to physically and electrically interconnect the Project safely and reliably to the CAISO controlled grid.

[5] The CAISO Tariff requires that the Project be able to meet power factor requirements of 0.95 lagging and 0.95 leading at the POI, if studies identify the need based on meeting reliability and safety requirements.

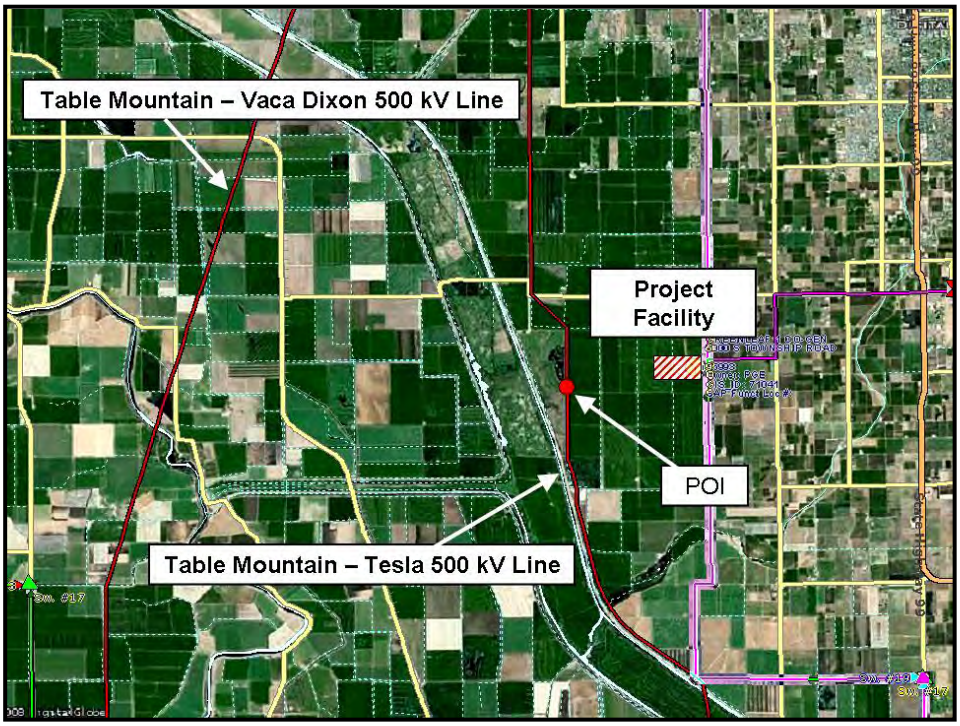


Figure 2-1: Vicinity Map

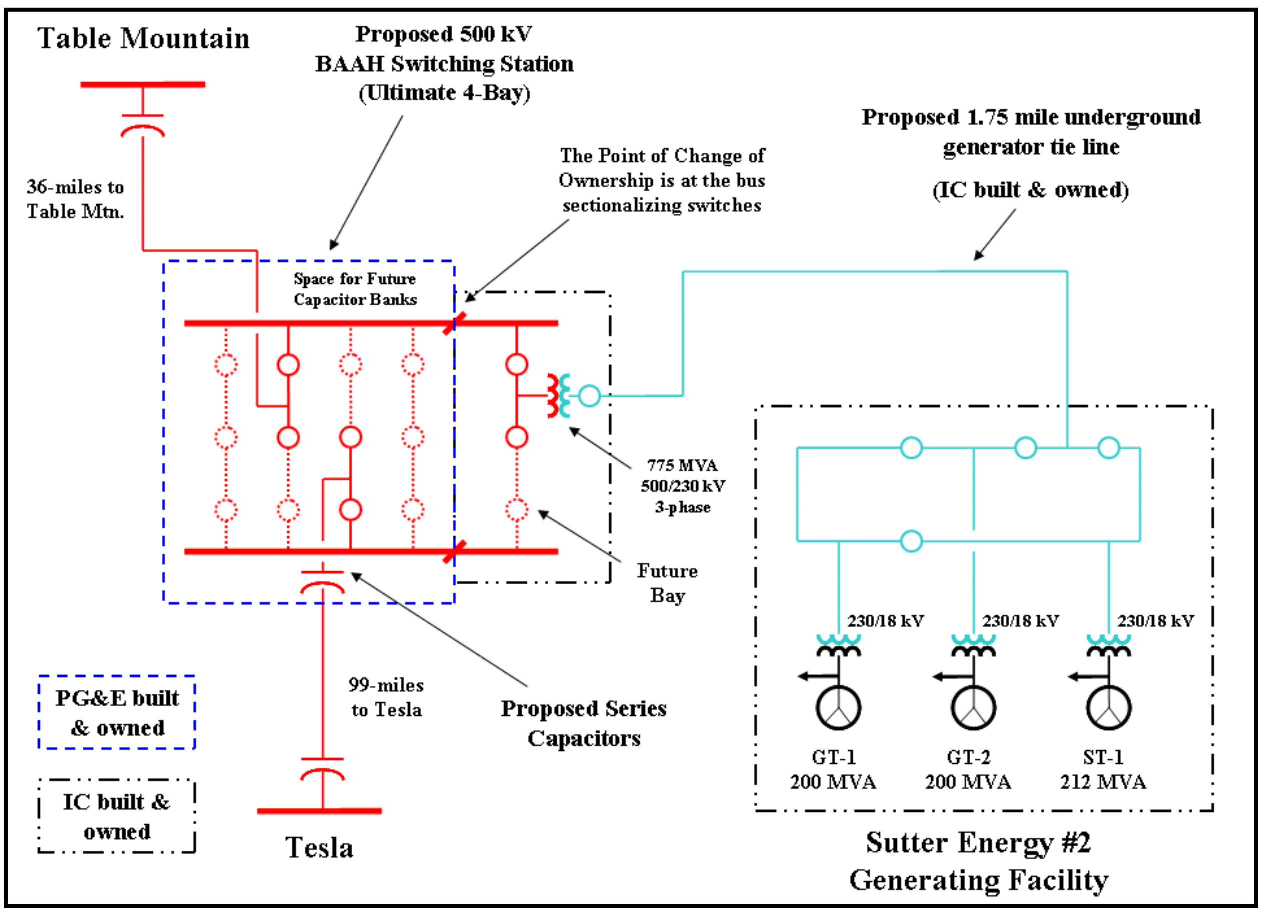


Figure 2-2: Conceptual Single Line Diagram

3. Study Assumptions

For detailed assumptions, please refer to the group report. The following assumptions are only specific to this Project:

1. The project consists of two gas turbines and one steam turbine, totaling a power output of 612 MW. The generator auxiliary load is 12 MW. The maximum net output to the CAISO controlled-grid is 600 MW.

2. The expected Commercial Operation Date of the Project is May 1, 2013.

3. The IC will engineer, procure, construct, own, operate and maintain its Project facility, including one bay of the new 500 kV Breaker-and-a-Half (BAAH) switching station, and the new 230 kV underground generator tie line from the Project facility to the new 500 kV BAAH switching station.

4. The 230 kV underground generator tie-line is approximately 1.75 miles and consists of 1431 AAC.

5. PG&E will engineer, procure, construct, own, operate and maintain the remaining new 500 kV BAAH switching station.

6. The new PG&E-owned portion of the 500 kV BAAH switching station will initially have two (2) bays upon Project interconnection, but land will be acquired for ultimate expansion to four (4) bays and available space for any future capacitor bank installation.

7. The amount of land required for the ultimate configuration and layout of the proposed BAAH switching station is estimated to be 800 ft by 1750 ft.

8. The Point of Change of Ownership between PG&E and the IC is at the bus sectionalizing switches in the proposed switching station.

4. Power Flow Analysis

The group study indicated that this project does not contribute to overloading of any transmission facilities in the PTO's system.

4.1 No Category "A" Normal Overloads

4.2 No Category "B" Emergency Overloads

4.3 No Category "C" Emergency Overloads

The details of the analysis and overload levels are provided in the group study report.

5. Short Circuit Analysis

Short circuit studies were performed to determine the fault duty impact of adding the Cluster 1, Cluster 2, and SGIP Transition Cluster projects to the transmission system and to ensure system coordination. The fault duties were calculated with and without the projects to identify any equipment overstress conditions. Once overstressed circuit breakers are identified, the fault current contribution from each individual project in the Cluster 1/Cluster 2 Phase II study is determined. If the fault current contribution of any project is higher than the threshold value of 100 amperes, that project will be responsible for its share of the upgrade cost based on the rules set forth in CAISO Tariff Appendix Y.

5.1 Short Circuit Study Input Data

The following input data provided by the IC for this Project was used in this study:

<u>Generator Short Circuit Data</u>

- Positive Sequence subtransient reactance (X''1) = 0.23 p.u.
- Negative Sequence subtransient reactance (X''2) = 0.17 p.u.
- Zero Sequence subtransient reactance (X''0) = 0.08 p.u.

<u>Main Station Step-up Transformer (total of three)</u>

- Three-phase 18/230 kV transformers, rated for 142/188/235 MVA OA/FA/FA at 55 degree C temperature rise with an impedance of 10% at 142 MVA base.

5.2 Results

The available short circuit duty at the buses electrically adjacent to the Cluster 1, Cluster 2, and SGIP Transition Cluster projects is listed in Appendix F in the PG&E North Area group report. This data was used to determine if any equipment is overstressed by the interconnection of the Cluster 1, Cluster 2, and SGIP Transition Cluster projects.

Using these short-circuit study results, an initial breaker evaluation found that this Project contributes more than the threshold value of 100 Amps to the following circuit breakers:

- Tesla 525 kV circuit beakers - CB 542, CB 632, CB 642

5.3 Preliminary Protection Requirements

Per Section G2.1 of the PG&E Interconnection Handbook, PG&E protection requirements are designed and intended to protect PG&E's system only. The

IC is responsible for the protection of its own system and equipment and must meet the requirements in the PG&E Interconnection Handbook.

These Preliminary Protection Requirements are based upon the interconnection plan as shown in Figure 2-2. The Preliminary Protection Requirements are detailed in Attachment 3.

Protection requirements may include, but are not limited, to direct transfer trip schemes installed at PG&E and IC facilities. The IC is responsible for installing the leased lines used for direct transfer trip communication and the necessary direct transfer trip transmitters.

6. Reactive Power Deficiency Analysis

The power flow studies of Category "A", Category "B" and Category "C" contingencies indicate that the Cluster 1, Cluster 2, and SGIP Transition Cluster projects did not cause voltage drops of 5% or more from the pre-project levels, or cause the PG&E system to fail to meet applicable WECC voltage criteria. Therefore, this Project did not cause any adverse voltage impacts on the CAISO controlled-grid.

7. Transient Stability Evaluation

Transient Stability studies were conducted using the 2014 summer peak full loop base cases to ensure that the transmission system remains in operating equilibrium, as well as operating in a coordinated fashion, through abnormal operating conditions after the Cluster 1, Cluster 2, and SGIP Transition projects begin operation. The generator dynamic data used in the study for this Project is shown in Attachment 1.

7.1 Transient Stability Study Scenarios

Disturbance simulations were performed for a study period of 10 seconds to determine whether the Cluster 1, Cluster 2, and SGIP Transition projects will create any system instability during a variety of line and generator outages. For this Project, the following line and generator outages were evaluated:

7.1.1 Category "B" Contingencies:

- Full load rejection of the 600 MW Project.
- A three-phase close-in fault on the Tesla – New Switching Station 500 kV Line at the Tesla Substation 500 kV bus with normal clearing time followed by loss of the Tesla – New Switching Station 500 kV Line.
- A three-phase close-in fault on the Tesla – New Switching Station 500 kV Line at the New Switching Station 500 kV bus with normal

clearing time followed by loss of the Tesla – New Switching Station 500 kV Line.

- A three-phase close-in fault on the Table Mountain – New Switching Station 500 kV Line at the Table Mountain Substation 500 kV bus with normal clearing time followed by loss of the Table Mountain – New Switching Station 500 kV Line.

- A three-phase close-in fault on the Table Mountain – New Switching Station 500 kV Line at the New Switching Station 500 kV bus with normal clearing time followed by loss of the Table Mountain – New Switching Station 500 kV Line.

- A three-phase close-in fault on the Table Mountain - Vaca Dixon500 kV Line at the Table Mountain Substation 500 kV bus with normal clearing time followed by loss of the Table Mountain - Vaca Dixon 500 kV Line.

- A three-phase close-in fault on the Tesla - Metcalf 500 kV Line at the Tesla Substation 500 kV bus with normal clearing time followed by loss of the Tesla - Metcalf 500 kV Line.

7.1.2 Category "C" Contingencies:

- A three-phase fault on the New Switching Station 500 kV bus with normal clearing time

- A three-phase fault on the Round Mountain Substation 500 kV bus with normal clearing time followed by loss of the Round Mountain – Table Mountain 500 kV lines #1 and #2.

- A three-phase fault on the Table Mountain Substation 500 kV bus with normal clearing time followed by loss of the Table Mountain - Tesla and Table Mountain – Vaca 500 kV lines.

- A three-phase fault on the Tesla 500 kV bus with normal clearing time followed by loss of the Table Mountain - Tesla and Vaca – Tesla 500 kV lines.

7.2 Results

The study concluded that the Project exacerbates pre-existing transmission system instability under certain Category "B" and Category "C" outage conditions. Therefore, this Project is not required to mitigate these pre-existing problems.

The results of the study are provided in the form of plots in Attachment 2.

8. Deliverability Assessment

8.1 On Peak Deliverability Assessment

CAISO performed an On-Peak Deliverability Assessment based on the 2014 Summer Peak conditions to determine whether the projects are capable of being delivered to the aggregated of load. The study was conducted using the assumptions and methodologies described in the On-Peak Deliverability Assessment Methodology which is available on the CAISO website at http://www.caiso.com/23d7/23d7e41c14580.pdf.

The power flow study results for Category “A”, “B”, and “C” from Deliverability Assessment are detailed in Attachment 5.

8.2 Off- Peak Deliverability Assessment

A modified version of the power flow 2014 Summer Off-Peak base case was created to perform the off-peak deliverability assessment. The study was conducted using the assumptions and methodologies described in the Off-Peak Deliverability Assessment Methodology which is available on the CAISO website at http://www.caiso.com/23d7/23d7e46815090.pdf.

The impacts of this project are shown in Attachment 5.

Under the CAISO Tariff Appendix Y, all SGIP Transition Cluster projects are considered “Energy Only” projects and therefore no deliverability assessment is performed.

9. Operational Studies

Operational studies for 2013 including Power flow, Short Circuit, Transient Stability, and Voltage assessment were performed on a year-by-year basis by adding projects in the base cases based on their Commercial Operation Date (COD). The purpose of these studies was to determine whether or not the required Reliability Network Upgrades and Delivery Network Upgrades can be constructed in a timely manner to safely and reliably interconnect this Project on the CAISO controlled-grid.

The detailed results of the Operational studies are shown in Attachment 7.

Power flow analysis indicated that no PTO facilities will be overloaded in the 2013 Operational studies.

Short Circuit analysis indicated that three (3) Tesla 525 kV circuit breakers will be overstressed.

Transient Stability analysis indicated that the system would be unstable under the selected disturbances in the vicinity of the Project and adverse stability impacts were found.

Voltage Assessment indicated that the Transmission System voltages under Category "B" and Category "C" contingency conditions were well within the PG&E operating guidelines and the voltage deviations were within the allowable NERC/WECC criteria.

Based on the estimated construction time for the above overloaded facilities, PG&E cannot guarantee that those facilities will be in service to meet the IC's COD. However, the CAISO believes that Special Protection Schemes (SPS) and/or operating procedures can be applicable in the interim period until the upgrades are completed. The Project will be treated as an "Energy Only" project during this interim period.

10. Environmental Evaluation/Permitting

10.1 CPUC General Order 131-D

PG&E is subject to the jurisdiction of the California Public Utilities Commission (CPUC) and must comply with CPUC General Order 131-D (Order) on the construction, modification, alteration, or addition of all electric transmission facilities (i.e., lines, substations, switchyards, etc.). This includes facilities to be constructed by others and deeded to PG&E. In most cases where PG&E's electric facilities are under 200 kV and are part of a larger project (i.e., electric generation plant), the Order exempts PG&E from obtaining an approval from the CPUC provided its planned facilities have been included in the larger project's California Environmental Quality Act (CEQA) review, the review has included circulation with the State Clearinghouse, and the generation project's lead agency (i.e., California Energy Commission) finds no significant unavoidable environmental impacts. PG&E or the project developer may proceed with construction once PG&E has filed notice with the CPUC and the public on the project's exempt status, and the public has had a chance to protest PG&E's claim of exemption. If PG&E facilities are not included in the larger project's CEQA review, or if the project does not qualify for the exemption, PG&E may need to seek approval from the CPUC (i.e., Permit to Construct) taking as much as 18 months or more since the CPUC would need to conduct its own environmental evaluation (i.e., Negative Declaration or Environmental Impact Report).

When PG&E's transmission lines are designed for immediate or eventual operation at 200 kV or more, the Order requires PG&E to obtain a Certificate of Public Convenience and Necessity (CPCN) from the CPUC unless one of the following exemptions applies: the replacement of existing power line facilities or supporting structures with equivalent facilities or structures, the minor relocation of existing facilities, the conversion of existing overhead lines (greater than 200 kV) to underground, or the placing of new or additional conductors, insulators, or their accessories on or replacement of supporting structures already built. Obtaining a CPCN can take as much as 18 months or more if the CPUC needs to conduct its own CEQA review, while a CPCN with the environmental review already done takes only 4-6 months or less.

Regardless of the voltage of PG&E's interconnection facilities, PG&E recommends that the project proponent include those facilities in its project description and application to the lead agency performing CEQA review on the project. The lead agency must consider the environmental impacts of the interconnection electric facility, whether built by the developer with the intent to transfer ownership to PG&E or to be built and owned by PG&E directly. If the lead agency makes a finding of no significant unavoidable environmental impacts from construction of substation or under-200 kV power line facilities, PG&E may be able to file an Advice Letter with the CPUC and publish public notice of the proposed construction of the facilities. The noticing process takes about 90 days if no protests are filed, but should be done as early as possible so that a protest does not delay construction. PG&E has no control over the time it takes the CPUC to respond when issues arise. If the protest is granted, PG&E may then need to apply for a formal permit to construct the project (i.e., Permit to Construct). Facilities built under this procedure must also be designed to include consideration of electric and magnetic field (EMF) mitigation measures pursuant to PG&E "EMF Design Guidelines for New Electrical Facilities: Transmission, Substation and Distribution". For projects that are not eligible for the Advice Letter/notice process but have already undergone CEQA review, PG&E would likely be able to file a "short-form" CPCN or PTC application, which takes about 4-6 months to process.

Please see Section III, in General Order 131-D. This document can be found in the CPUC's web page at:

http://www.cpuc.ca.gov/PUBLISHED/GENERAL_ORDER/589.htm

10.2 CPUC Section 851

Because PG&E is subject to the jurisdiction of the CPUC, it must also comply with Public Utilities Code Section 851. Among other things, this code provision requires PG&E to obtain CPUC approval of leases and licenses to use PG&E property, including rights-of-way granted to third parties for Interconnection Facilities. Obtaining CPUC approval for a Section 851 application can take several months, and requires compliance with CEQA. PG&E recommends that Section 851 issues be identified as early as possible so that the necessary application can be prepared and processed. As with GO 131-D compliance, PG&E recommends that the project proponent include any facilities that may be affected by Section 851 in the lead agency CEQA review so that the CPUC does not need to undertake additional CEQA review in connection with its Section 851 approval.

11. Upgrades, Cost Estimates and Construction Schedule Estimates

In order to determine the cost responsibility of each generation project in the Cluster 1/Cluster 2 Phase II study, the CAISO developed cost allocation factors based on the individual contribution of each project (Attachment 6). The cost allocation for the Interconnection Facilities and Network Upgrades for which this project is solely responsible is as follows:

Table 11-1: Upgrades, Estimated Costs, and Estimated Time to Construct Summary

Type of Upgrade	Upgrade	Description	Cost Allocation Factor	Estimated Cost (x 1,000)	Estimated Time to Construct *(Note 1)*
PTO's Interconnection Facilities *(Note 2)*	Work at IC's site	• Pre-parallel inspection, testing, SCADA/EMS setup, meters, PG&E remote terminal units, etc.	100%	$541	12-18 Months
Reliability Network Upgrades	New PG&E 500 kV Switching Station	• 2-bay (5-breakers) BAAH upon interconnection of Project • Ultimate 4-bay BAAH arrangement	100%	$26,195	36-48 Months
	Table Mountain Substation	• Associated relay setting changes	100%	$38	12-18 Months
	Tesla Substation	• Associated relay setting changes • Modification of existing RAS schemes	100%	$113	12-18 Months
	Vacaville Grid Control Center	• Implementation of RAS scheme	100%	$293	24-36 Months
	San Francisco Control Center	• Implementation of RAS scheme	100%	$293	24-36 Months
	500kV System Coordination	• Modification and coordination of existing RAS schemes	100%	$335	24-36 Months
	Transmission Line Upgrades	• Install two (2) new HVS towers • Install a minimum of two (2) new additional HVS towers based on switching station location • Remove one (1) HVS tower	100%	$6,200	24-36 Months
	Overstressed Circuit Breakers	• Replace three (3) 525 kV circuit breakers • CB 542, CB 632, CB 642	100%	$9,000	36-48 Months
	500 kV Series Capacitors	• Installation of approx. 15 ohm series capacitors on at the new 500 kV switching station	100%	$20,000	24-36 Months
			Total	**$63,008**	

***Note 1**: The Estimated Time to Construct is the schedule for the PTO to complete only the construction activities for the specified facility. The estimated schedule does not take into account unanticipated delays, or difficulties in securing necessary permits, licenses or other approvals; construction difficulties or potential delays in the project implementation process; or unanticipated delays or difficulties in obtaining and receiving necessary clearances for interconnection of the project to the transmission system.*

***Note 2:** The Interconnection Customer (IC) is obligated to fund these upgrades and will not be reimbursed.*

Table 11-2: PTO Interconnection Facilities Cost Estimate Summary

Interconnection Facility Element	Cost (Subject to ITCC)	Total Cost Excluding ITCC *(Note 3)*
Substation Work		
Engineering	$64,000	$541,000
Project Management	$78,000	
Insulation and Coating	$21,000	
Telecommunications	$293,000	
Station Test Group	$21,000	
Maintenance & Operations	$24,000	
Metering	$40,000	
Subtotal	**$541,000**	
	Total	**$541,000**

Note 3: *Not subject to ITCC on contribution. ITCC is exempt for wholesale generators that meet the IRS Safe Harbor Provisions. PG&E currently does not require the Interconnection Customer to provide security to cover the potential tax liability on the Interconnection Facilities, Distribution Upgrades, and Network Upgrades per the IRS Safe Harbor Provisions (IRS Notice 88-129). PG&E reserves the right to require the Interconnection Customer to provide such security, in a form reasonably acceptable to PG&E as indicated in Article 11 of the SGIA, an amount up to the cost consequences of any current tax liability. Upon request and within sixty (60) Calendar Days' notice, the Interconnection Customer shall provide PG&E such ITCC security or ITCC payment in the event that Safe Harbor Provisions have not been met, in the form requested by PG&E.*

Detailed scope of work and cost estimates for the Substation and Transmission Interconnection Facilities and Network Upgrades can be found in Attachment 8.

The non-binding construction schedule to engineer and construct the facilities is based on the assumptions outlined in Section 3 of this report, and is applicable from the signing of the Generator Interconnection Agreement (GIA). This is also based upon the assumption that the environmental permitting obtained by the IC is adequate for permitting all PG&E activities.

It is assumed that the IC will include the PG&E's Interconnection Facilities and Network Upgrades work scope, as they apply to work within public domains, in its environmental impact report to the CPUC. However, note that CPUC may still require the PG&E to obtain a Permit to Construct (PTC) or a Certificate of Public Convenience and Necessity (CPCN) for the generator tie line and Network Upgrades work associated with the Project. Hence, the facilities needed for the project interconnection could require an additional two to three years to complete. The cost for obtaining any of this type of permitting is not included in the above estimates.

12. Technical Requirements

The PG&E Interconnection Handbook explains the technical requirements for interconnection of loads and generators to PG&E's transmission system. The Interconnection Handbook documents facility connection requirements to the PG&E

system as required in NERC Standard FAC-001-0. They are based on applicable FERC and CPUC rules and tariffs (e.g., Electric Rules 2, 21 and 22), as well as accepted industry practices and standards. In addition to providing reliability, these technical requirements are consistent with safety for PG&E workers and the public.

The PG&E Interconnection Handbook applies to Retail and Wholesale Entities, which own or operate generation, transmission, and end user facilities that are physically connected to, or desire to physically connect to PG&E's electric system. All technical requirements described or referred to in the Handbook apply to new or re-commissioned Generation Facilities. The Generation Interconnection Handbook comprising sections G-1 through G-5 applies to Generation Entities.

PG&E has established standard operating, metering and equipment protection requirements for loads and generators. The Interconnection Handbook covers such requirements for all transmission-level load and generation entities wishing to interconnect with PG&E's electric system. Additional, project-specific requirements may apply and are documented in this SIS report.

The PG&E Interconnection Handbook includes, but is not limited to such operating requirements as the following:

- The Project must have Automatic Voltage Regulation (AVR) and be able to maintain the generator voltage under steady-state conditions within ±0.5 percent of any voltage level between 95 percent and 105 percent of the rated generator voltage.

Generators must also meet all applicable CAISO, NERC, and Western Electric Coordinating Council (WECC) standards. NERC and WECC standards include, but are not limited to such requirements as the following:

- The Project must be able to remain on line during voltage disturbances up to the time periods and associated voltage levels as required by the WECC Low Voltage Ride Through (LVRT) standards that are in-line with FERC Order No. 161-A. The WECC LVRT standard is available on the WECC web site at:

  http://www.wecc.biz/committees/StandingCommittees/PCC/TSS/Shared%20Documents/Voltage%20Ride%20Through%20White%20Paper.pdf

- Currently NERC is working on a Voltage Ride Through standard, PRC-024-1, that would be applicable to all generators interconnecting to the transmission grid. Until PRC-024-1 is effective, PG&E and the CAISO will require that all generators comply with the existing WECC LVRT requirements. The PRC-024-1 standard Draft 1 can be found on the NERC web site at

  http://www.nerc.com/docs/standards/sar/PRC-024-1_Draft1_2009Feb17.pdf

All generators must satisfy the requirements of the PG&E's Interconnection Handbook and meet all applicable CAISO, NERC, and WECC standards. PG&E will not agree to interconnect any new generators unless all technical and contractual requirements are met.

The IC should be aware that the information in the PG&E Interconnection Handbook is subject to change. Parties interconnecting to the PG&E electric system should verify with their PG&E representative that they have the latest versions. The PG&E Interconnection Handbook is available on the PG&E web site at:

http://www.pge.com/about/rates/tariffbook/ferc/tih/

Additionally, the Q0569 project Interconnection Customer (IC) must be aware of the potential Subsynchronous Resonance (SSR) and Single Pole Tripping (High speed reclosing on a single pole tripping) issues when interconnecting generation near series compensation. The IC will assume all responsibility for any damage to their equipment. The IC is also solely responsible for any determination of possible SSR interactions, single pole tripping requirements and counter measures.

13. Coordination with Affected Systems

CAISO LGIP tariff Appendix Y section 3.7 requires the CAISO to coordinate with any Affected Systems that may be potentially impacted by the C1C2 projects. The CAISO will notify the Affected Systems of the potential impacts and coordinate any studies required to determine the impact of the C1C2 projects on Affected Systems with Affected System Operators, to the extent possible, the CAISO will include those results (if available) in its applicable Interconnection Study within the specified time frame.

Also, as part of PG&E's obligations to NERC as the registered Transmission Owner for the PG&E transmission system, the study results of this interconnection will be communicated to the neighboring entities that may be impacted for purposes of coordination and incorporation in the neighboring entity's transmission assessments. Input from the CAISO and other neighboring entities are solicited to ensure coordination of transmission systems.

In addition, the interconnection of the C1C2 projects should not adversely affect the ability of PG&E to honor its Encumbrances, including under the Owners Coordinated Operation Agreement (OCOA). For example, the OCOA requires avoidance of system changes that would adversely impact existing California/Oregon Intertie (COI) transfers; reduce the rated system transfer capacity (RSTC) or available system transfer capacity (ASTC) of the Pacific AC Intertie between Malin and Tesla (PACI) and/or the California Oregon Transmission Project (COTP); or cause increased risk of curtailments of the PACI and/or COTP. Specifically as noted in Appendix E of the North Area Group Report and the results of dynamic stability studies described in this report, Projects Q554 and Q569 show the following incremental overloads (i.e., increases the pre-existing overload conditions), among other issues identified in this report:

- Round Mountain 500/230 kV bank
- Olinda 500/230 kV bank (Affected System: COTP)
- Cottonwood - Olinda 230 kV Lines (Affected System: WAPA)

Note 4: The overload of the Round Mountain 500/230 kV bank and Olinda 500/230 kV bank were identified under the spring off-peak conditions only. Therefore, since Project Q569 was not dispatched during the spring off-peak conditions, Q569 is not responsible for contributing to these incremental overloads.

Pursuant to the CAISO's procedures, the CAISO will notify the Affected Systems of these impacts. Each IC identified above will be responsible to reach an agreement with each Affected System regarding a solution to ameliorate these identified impacts. The agreed-upon solution must avoid adversely impacting existing COI transfers, reducing the rated system transfer capability (RSTC) or available system transfer capacity (ASTC) of the PACI and/or COTP, or causing increased risk of curtailments of the PACI and/or COTP, and the solution may not rely upon curtailment of existing generation within the CAISO. The IC bears cost responsibility for the solutions. The CAISO will not release an IC for commercial operation until the IC has reached an agreement with each Affected System for appropriate solutions.

Likewise, for any C1C2 project that has initiated WECC path rating studies for COI, if these studies indicate system performance deficiencies that adversely affect the existing transfer levels at COI, PACI, or COTP, then it is the responsibility of the IC to mitigate the system performance deficiencies by curtailment of the output of the IC's generation so that PG&E's OCOA Encumbrances are honored.

13.1 Maintenance of Encumbrances

Per CAISO Tariff Section 25.3, new generating facilities shall not adversely impact PG&E's ability to honor its existing Encumbrances. PG&E, in consultation with the CAISO, will identify any adverse effects on its Encumbrances in the interconnection studies. To the extent that PG&E determined that the interconnection of the new generating facility have an adverse effect on Encumbrances on COI owners, the study results herein include mitigation for such adverse effect and some of these are discussed above.

13.2 Affected Systems

The study identified transient stability issues as noted in Section 7. The impacted transmission facilities were found to be within the WAPA and COTP service territories. These concerns may require further investigation by the Affected Systems.

14. Items not covered in this study

The study does not address any requirements for standby power that the Project may require. The IC should contact their PG&E Generation Interconnection Services representative regarding this service.

Note 5: *The IC is urged to contact their PG&E Generation Interconnection Services representative promptly regarding standby service in order to ensure its availability for the Project's start up date.*

Attachment 8

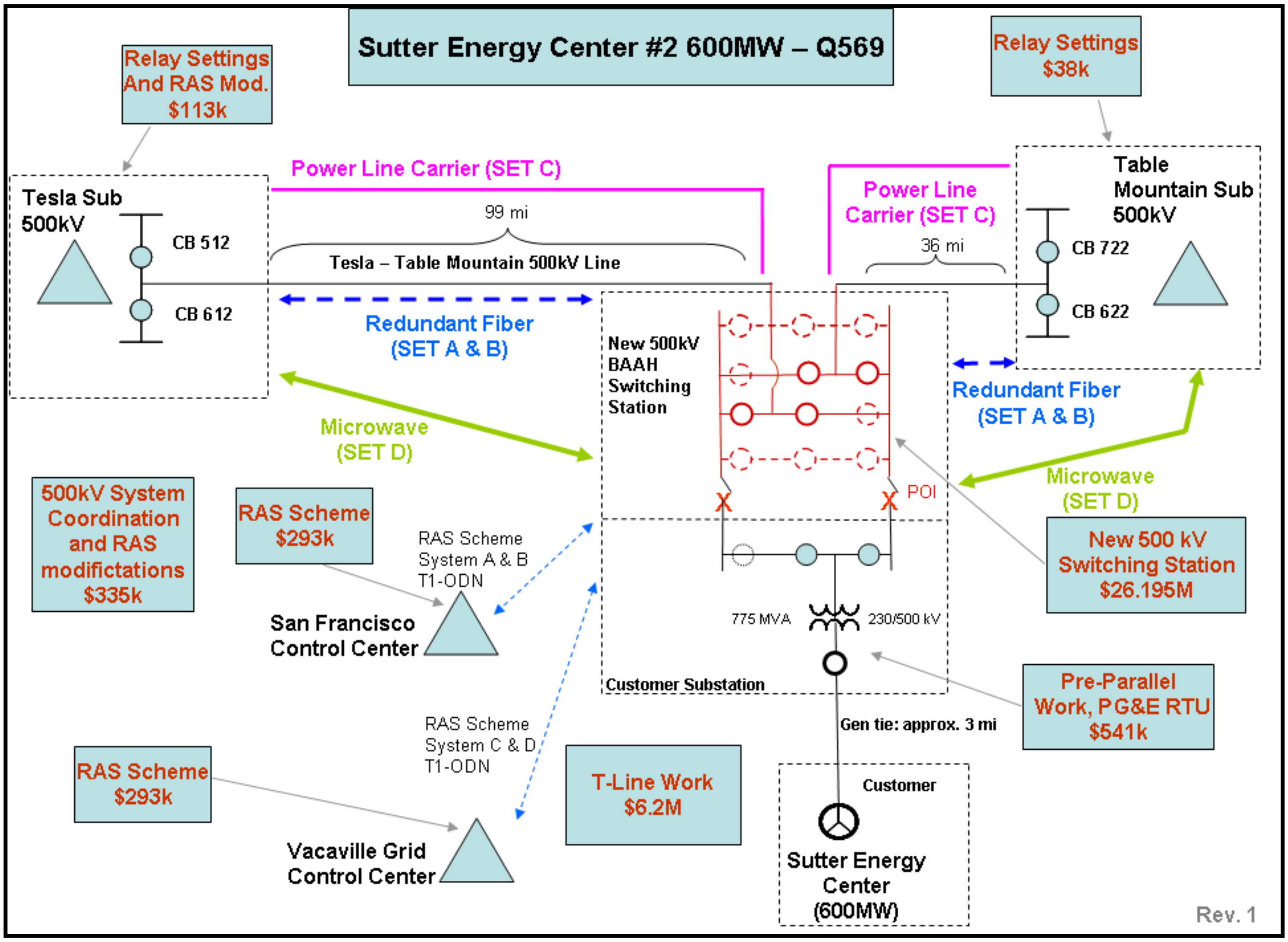
Substation and Transmission Detailed Work and Estimates

Revision 1

Preliminary PG&E Substation Job Scope
Phase II Study
CPN Sutter Energy Center #2 - Q569
600 MW Generating Facilities

Assumptions and Clarifications

1. This proposed preliminary substation scope is based on PG&E Preliminary Protection Requirements dated 10/18/2010.
2. PG&E requires that a new 500kV PG&E-owned switching station is installed on the Table Mountain – Tesla 500kV Line.
3. New switching station configuration will be a two bay, breaker-and-a-half (BAAH) configuration with land available to expand to an ultimate of four bays. The final land requirements will be determined when the precise location and orientation of the new switching station are confirmed during the implementation phase.
4. For the purposes of this study, it is assumed that the Customer will provide a fully graded and compacted site prior to any construction activity by PG&E.
5. PG&E projects ahead of this project at Table Mountain and Tesla Substations will have already upgraded telecomm and protection equipment and made available for this project. However, if the leading projects do not proceed, then Q569 will have to perform the necessary telecomm and protection upgrades.
6. The RAS schemes for the new 500kV switching station require further analysis to identify any remedial actions needed (i.e. Tripping a remote line or generator). Implementing these actions may require additional protection and telecommunications equipment at other PG&E sites not covered in this scope.
7. There are existing line relay upgrade projects at both Tesla and Table Mountain Substations. These upgrades are expected to install the relays required by System Protection in this study.
8. There are existing line shunt reactor upgrades at the Table Mountain terminal of the 500kV Tesla-Table Mountain line. These upgrades are expected to replace the shunt reactors, and install the required protection equipment and relays required by System Protection in this study.
9. An EMTP study will be done during the implementation phase in order to determine the proper location of any neutral ground reactors needed on the 500kV system as a result of this added generation.


Sutter Energy Center #2 600MW – Q569
Relay Settings And RAS Mod. $113k
Relay Settings $38k
Power Line Carrier (SET C)
Power Line Carrier (SET C)
Tesla Sub 500kV
CB 512
CB 612
99 mi
Tesla – Table Mountain 500kV Line
36 mi
Table Mountain Sub 500kV
CB 722
CB 622
Redundant Fiber (SET A & B)
Redundant Fiber (SET A & B)
New 500kV BAAH Switching Station
Microwave (SET D)
Microwave (SET D)
POI
500kV System Coordination and RAS modifictations $335k
RAS Scheme $293k
RAS Scheme System A & B T1-ODN
San Francisco Control Center
New 500 kV Switching Station $26.195M
775 MVA
230/500 kV
Customer Substation
Pre-Parallel Work, PG&E RTU $541k
Gen tie: approx. 3 mi
RAS Scheme System C & D T1-ODN
RAS Scheme $293k
T-Line Work $6.2M
Customer
Sutter Energy Center (600MW)
Vacaville Grid Control Center
Rev. 1

New 500kV Switching Station

Engineer, design and build a new PG&E-owned 500kV breaker-and-a-half (BAAH) switching station to accommodate two 500kV transmission line positions. The land required for the switching station (four bay, ultimate configuration) is estimated to be 800’ by 1750’.

Directly adjacent to the new switching station, there will be a customer-owner single bay, BAAH, substation to accommodate one 230kV generation tie line. The customer will step up the voltage to 500kV and tie into the new PG&E 500kV switching station main buses. At the point of interconnection there will be PG&E controlled disconnect switches.

Outdoor Work:

Major equipment or installation includes following:

- Four 500kV circuit breakers, SF6 gas type, rated 550kV, 4000 ACC, 63kAIC; CT’s must have 3000:5 tap and C1200 accuracy class.
- Ten 500kV disconnect switches, manually operated, for breaker disconnect, and mounted on low profile support structures.
- Six 500kV voltage transformers on single-phase steel support structures for line voltage.
- Six 500kV voltage transformers on single phase steel support structures for bus voltage.
- Two 500kV wave traps for Power Line Carrier Coupling.
- An estimated one hundred and twenty-two (122) 1-phase bus supports.
- Ground conductors, ground rods, and associated hardware for a complete grounding system, including ground wells if needed.
- Underground conduits, pull boxes, and junction boxes.
- Chain link fence with entrance gates.
- One control building and foundation.
- Six 500kV dead-end/pull off structures to interface with transmission lines and generator tie lines coming into the station.
- Two sources of AC power for station service.
- Outdoor AC panel, lighting panel, and transfer switch.
- Outdoor lighting and AC outlets.
- Civil foundations & minor site surfacing, grading, drainage, etc. The majority of the site grading is assumed to be provided by the Customer.
- Microwave communication equipment and tower.

Indoor Work:

One MPAC (Modular Protection, Automation and Control) control building consisting of the following:

- One or two line-ups of switch rack panels for operation and control of two positions of a 500kV BAAH switching station.

- The relay protection package per 500kV breaker will conform to the following specifics:
  1. Breaker failure and reclose protection: SEL 451
  2. Bus protection (bus 1 and 2): SEL 587Z and GE F35
  3. Line protection: SET A - GE L90, SET B – GE L90, SET C - SEL 421, SET D – SEL 421
  4. Relays shall be arranged in two cabinets with SETS A & C and SETS B & D in two separate cabinets. Each relay SET shall have an independent 125Vdc power supply, total of four (4).
  5. Manual-open cut-out SCADA ready switch.
  6. Manual Trip/close switch.
  7. Breaker maintenance switch.
  8. Auto/manual switch.

- Telecomm requirements for relay communication:
  1. SET A – Fiber Equipment
  2. SET B – Fiber Equipment
  3. SET C – Power Line Carrier Equipment
  4. SET D – Microwave Equipment

- RAS Scheme requirements (System AC):
  1. Three (3) N60 Relays
  2. One (1) cut-out switch
  3. One (1) Local/remote Switch
  4. One (1) Ethernet Switch
  5. ODN fiber link to San Francisco and Vacaville Grid Control Center

- RAS Scheme requirements (System BD):
  1. Three (3) N60 Relays
  2. One (1) cut-out switch
  3. One (1) Local/remote Switch
  4. One (1) Ethernet Switch
  5. ODN fiber link to San Francisco and Vacaville Grid Control Center

- Phasor Measurement Unit (PMU) Requirements:
  1. PMU: ABB RES 521
  2. Vector Processor: SEL 3378
  3. PMU Concentrator and Storage Devices

- Two (2) GPS Clocks
  1. Line SET A, B, C, & D
  2. TWS Fault Locator

- Traveling Wave Fault Locator: Tele-fault TWS Mark V.
- 500kV Fault Recorder: AMETEK fault recorder.
- Two 125 VDC circuit breaker distribution panel.
- 120/240 VAC circuit breaker panel.
- General lighting and AC receptacles.
- Fire detection and protection system.
- SCADA for switching station automation.
- HMI for switching station automation, GE C30, etc.
- Communication hardware.
- 125 VDC station battery and charger (in a separate room within the MPAC building).

PG&E Table Mountain Substation

There are projects that have proceeded to upgrade the Table Mountain-Tesla 500kV Line protection schemes. The following protection schemes are required at Table Mountain Substation to the new 500kV Switching Station:

- SET A & B – Protection Scheme utilizing GE L90 relays via Fiber
- SET C – Protection Scheme utilizing SEL 421 relays via Power Line Carrier
- SET D – Protection Scheme utilizing SEL 421 relays via Microwave.

For each of the above schemes, special equipment is required. The condition and capability of the equipment will be evaluated when this project enters implementation phase. The scope is expected to be limited to relay setting changes.

PG&E Tesla Substation

There are projects that have proceeded to upgrade the Table Mountain-Tesla 500kV Line protection schemes. The following protection schemes are required at Table Mountain Substation to the new 500kV Switching Station:

- SET A & B – Protection Scheme utilizing GE L90 relays via Fiber
- SET C – Protection Scheme utilizing SEL 421 relays via Power Line Carrier
- SET D – Protection Scheme utilizing SEL 421 relays via Microwave.

For each of the above schemes, special equipment is required. The condition and capability of the equipment will be evaluated when this project enters implementation phase. The scope is expected to be limited to line relay setting changes, as well as modifications to the RAS schemes..

PG&E San Francisco Control Center

The PG&E protection engineer requires a RAS scheme between San Francisco Control Center and the new 500kV Switchyard.

- The relay package should include two (2) N60 relays
- Update the RAS tables.
- Interface equipment between N60 relays and PACIRAS controllers.

PG&E Vacaville Grid Control Center

The PG&E protection engineer requires a RAS scheme between San Francisco Control Center and the new 500kV Switchyard.

- The relay package should include two (2) N60 relays
- Update the RAS tables.
- Interface equipment between N60 relays and PACIRAS controllers.

Generation Developer's Substation

- The Interconnection Customer is required to comply with all the applicable requirements in the PG&E Interconnection Handbook, plus specific requirements established for this project.
- PG&E will review Customer's protection and revenue metering design and will install PG&E revenue meter inside a customer-provided metering enclosure.
- PG&E will provide pre-parallel inspection and witness testing at the Customer's facility.
- PG&E will install a "PG&E RTU" for the required SCADA/EMS telemetry for PG&E's visibility, presumably in a 19-inch open rack in a space provided by the Customer.
- PG&E's proposed installation at the Interconnection Customer's facility does not include installation of raceways and the pulling of wires and cables between the PG&E RTU and Customer's equipment, or the DC and AC power supply that may be required. This DC power supply should come from the Interconnection Customer's flooded type lead-acid battery system.
- The Customer is required to obtain and provide all the required leased circuits and phone lines in accordance with PG&E's Interconnection Handbook and specific requirements established for this project.

Transmission Line Scope of Work

The Sutter Energy II project interconnection will require rerouting of the existing 500kV Table Mountain-Tesla Switching Center Transmission Line, which is a single-circuit line supported by steel towers. The existing conductor is 2-2300 kcmil 61-strand AAC. Based on the current Sutter Energy II location, the transmission line will be rerouted near existing tower 34/134 and 34/135. The towers will be replaced with new HVS towers, placed near the existing tower in line with the existing transmission centerline. The final quantity of towers required to complete the reroute cannot be determined until the substation location has been finalized, but at this stage it is assumed that two (2) additional towers will be required to provide service to the proposed substation. The estimated installed cost of one HVS tower is $1,500,000. The estimated removal cost of one HVS tower is $200,000.

Transmission Line Scope of Work – Total Cost: $6,200,000.00

1.) Install two (2) new HVS tower. Cost: $3,000,000.
2.) Install a minimum of two (2) additional new HVS tower. Cost: $3,000,000.
3.) Remove one (1) HVS towers. Cost: $200,000

Transmission Line Estimate Assumptions:

- This cost estimate has not been based on any feedback from general construction. It is assumed that there are no field-installation issues with the proposed structure locations.
- This cost estimate does not include any costs associated with permitting, environmental costs, TES, biological costs or any land or right-of-way acquisition.
- This cost estimate is based on standard auger-type foundations. If soil conditions require the use of pile foundations, cost may increase.
- This cost estimate does not include handling or disposal of hazardous material or soil contamination found at the site locations.
- This cost estimate does not include removal fees for existing lines.
- This cost estimate assumes adequate space will be available for construction equipment during installation of new structures.

COST SUMMARY & BREAK DOWN ON SUSTATION-PROVIDED ESTIMATES								
Q569 Sutter Energy Center #2 - 600 MW Generating Facility								
ESTIMATED ITEMS	PG&E Vacaville Grid Control Center RAS Scheme	PG&E San Francisco Control Center RAS Scheme	PG&E Table Mountain Substation, Relay Settings	PG&E Tesla Substation, Relay Settings	500kV System Coordination and RAS modification	PG&E New 500kV Sutter 2 bay 4 CB BAAH Switching Station	Developer's Gen Site Sutter Energy Center (RTU)	Subtotal of Each Task or Sub-catgory
Type of Work (DA or NU)	NU	NU	NU	NU	NU	NU	DA	
ENGINEERING (Substation Engr, Protection Engg, Automation Engr, etc, but excluding ISTS Engr and Design)	$151,000	$151,000	$15,000	$90,000	$264,000	$921,000	$64,000	$1,656,000
LAND & LAND RIGHTS	$0	$0	$0	$0	$0	$74,000	$0	$74,000
PROJECT MANAGEMENT and Other (Pro-rated for each location but excluding ISTS PM)	$16,000	$16,000	$5,000	$5,000	$0	$200,000	$78,000	$320,000
Property Improvements	$0	$0	$0	$0	$0	$240,000	$0	$240,000
Civil Foundations	$0	$0	$0	$0	$0	$2,073,000	$0	$2,073,000
STATION EQUIPMENT & LABOR (includes materials and labor)	$96,000	$96,000	$0	$0	$0	$18,566,000	$0	$18,758,000
REMOVAL	$0	$0	$0	$0	$0	$0	$0	$0
TELECOMMUNICATIONS (includes ISTS Engg and Design, & CONSTRUCTION labor and materials, plus fees for land lease)	$0	$0	$0	$0	$0	$2,809,000	$293,000	$3,102,000
Insulation and Coating and Various Other Groups	$0	$0	$0	$0	$0	$743,000	$21,000	$764,000
STATION TEST GROUP (includes pre-parallel inspection at Gen site if applicable)	$27,000	$27,000	$15,000	$15,000	$52,000	$513,000	$21,000	$670,000
MAINTENANCE AND OPERATIONS	$3,000	$3,000	$3,000	$3,000	$19,000	$56,000	$24,000	$111,000
METERING DEPARTMENT	$0	$0	$0	$0	$0	$0	$40,000	$40,000
SUBTOTAL BEFORE APPLYING ANY ITCC TAX	$293,000	$293,000	$38,000	$113,000	$335,000	$26,195,000	$541,000	$27,808,000

Notes
1. This estimate is preliminary. Accuracy is expected to be +/- 20%
2. N/A
3. This does not include any applicable ITCC tax
4. Refer to Substation Scope Document for details of substation job scope
5. Customer is responsible for Metering costs at Gen. Site.
6. Telecommunications cost for new switching station includes redundant communication infrastructrue to Tesla and Table Mountain Substations.

Appendix 3.1A
Emissions Calculations and Support Data

APPENDIX 3.1A

Calculation of Maximum Hourly, Daily, and Annual Emissions

Tables presented in this Appendix are as follows:

Also included in this appendix:

Table 3.1A-1 Aux Boiler
Calculation of Criteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode: 25-100% MCR

Ops Hr/Day:	24	Worst Case		# of Units:	1
Ops Hr/Yr:	8273	see Table 3.1A-3 for SU/SD emissions		Fuel Type:	Nat Gas

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lbs/mmbtu	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr	All Units Maximum Hourly Emissions, lb/hr	All Units Maximum Daily Emissions, lb/day	All Units Maximum Annual Emissions, lbs/yr	All Units Annual Emissions, ton/yr
NOx	0.0056	0.73	17.52	6038.0	3.02	0.73	17.52	6038.0	3.02
CO	0.0370	4.82	115.73	39894.1	19.95	4.82	115.73	39894.1	19.95
VOC	0.0040	0.52	12.51	4312.9	2.16	0.52	12.51	4312.9	2.16
SOx	0.0030	0.39	9.38	3234.7	1.62	0.39	9.38	3234.7	1.62
PM10	0.0070	0.91	21.90	7547.5	3.77	0.91	21.90	7547.5	3.77
PM2.5	0.0070	0.91	21.90	7547.5	3.77	0.91	21.90	7547.5	3.77
	lbs/MMbtu								
CO2	116.95000	15242.09	365810.24	126097839.53	63048.92	15242.09	365810.24	126097839.53	63048.92
Methane	0.01300	1.69	40.66	14016.86	7.01	1.69	40.66	14016.86	7.01
N2O	0.00022	0.03	0.69	237.75	0.12	0.03	0.69	237.75	0.12
CO2e								*short tons*	63232.9
								metric tons	57485.1

Notes:
(1) natural gas criteria pollutant EF factors
(2) Based on maximum hourly heater fuel use of 130.33 MMBtu/hr/boiler
and fuel HHV of 1010 Btu/scf gives 0.1290 MMscf/hr/boiler.
(3) Based on maximum annual heater fuel use of 1,078,220 MMBtu/yr/boiler
and fuel HHV of 1010 Btu/scf gives 1067.5446 MMscf/yr/boiler.
(4) PM2.5 = PM10

Refs:
(1) EFs Rentech Boiler Systems, 1-3-13
(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.
(3) LNBs/FGR and SCR
(4) NH3 slip at 5 ppm

Exh Flow	114988.00	lbs/hr
Exh Flow	38502.00	acfm
Exh Temp	300.00	deg F
Exh Vel	60.77	ft/sec
Stk Ht	45.00	ft.
Stk Diam	44.00	in.

Table 3.1A-2 Aux Boiler Emissions
Calculation of Noncriteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Heater Operation Mode: 25-100% MCR
Ops Hr/Day: 24
Ops Hr/Yr: 8760

\# of Units: 1
Fuel Type: Nat Gas

Calculation of Noncriteria Pollutant Emissions from Each Identical Unit

						All Units			
Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr
Acetaldehyde	8.87E-03	1.14E-03	2.75E-02	1.00E+01	5.01E-03	1.14E-03	2.75E-02	1.00E+01	5.01E-03
Acrolein	4.51E-03	5.82E-04	1.40E-02	5.10E+00	2.55E-03	5.82E-04	1.40E-02	5.10E+00	2.55E-03
Ammonia	(5)	5.30E-01	1.27E+01	4.64E+03	2.32E+00	5.30E-01	1.27E+01	4.64E+03	2.32E+00
Benzene	4.31E-03	5.56E-04	1.33E-02	4.87E+00	2.44E-03	5.56E-04	1.33E-02	4.87E+00	2.44E-03
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	9.50E-03	1.23E-03	2.94E-02	1.07E+01	5.37E-03	1.23E-03	2.94E-02	1.07E+01	5.37E-03
Formaldehyde	1.70E-02	2.19E-03	5.26E-02	1.92E+01	9.61E-03	2.19E-03	5.26E-02	1.92E+01	9.61E-03
Hexane	6.30E-03	8.13E-04	1.95E-02	7.12E+00	3.56E-03	8.13E-04	1.95E-02	7.12E+00	3.56E-03
Naphthalene	3.00E-04	3.87E-05	9.29E-04	3.39E-01	1.70E-04	3.87E-05	9.29E-04	3.39E-01	1.70E-04
PAHs (4)	4.00E-04	5.16E-05	1.24E-03	4.52E-01	2.26E-04	5.16E-05	1.24E-03	4.52E-01	2.26E-04
Propylene	7.31E-01	9.43E-02	2.26E+00	8.26E+02	4.13E-01	9.43E-02	2.26E+00	8.26E+02	4.13E-01
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	3.66E-02	4.72E-03	1.13E-01	4.14E+01	2.07E-02	4.72E-03	1.13E-01	4.14E+01	2.07E-02
Xylene	2.72E-02	3.51E-03	8.42E-02	3.07E+01	1.54E-02	3.51E-03	8.42E-02	3.07E+01	1.54E-02
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs factors
(2) Based on maximum hourly boiler fuel use of 130.33 MMBtu/hr/boiler
and fuel HHV of 1010 Btu/scf gives 0.1290 MMscf/hr/boiler.
(3) Based on maximum annual boiler fuel use of 1,141,691 MMBtu/yr/boiler
and fuel HHV of 1010 Btu/scf gives 1130.3869 MMscf/yr/boiler.
(4) PAHs - Polycyclic aromatic hydrocarbons
(5) Ammonia based SCR proposed for this small aux boiler

Refs:
CARB Catef Database
SDAPCD, B17, Toxics Efs Database
SCAQMD, 6/2/2000

Table 3.1A-3 Aux Boiler

Calculation of Criteria Pollutant Emissions for Boilers Firing Gaseous Fuels

Boiler Operation Mode:	SU/SD Mode		# of Units:	1
Ops Hr/Day:	1.33	Worst Case	Fuel Type:	Nat Gas
Ops Hr/Yr:	487	see Table 3.1A-1 for steady state emissions		

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lbs/mmbtu (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units Maximum Hourly Emissions, lb/hr	All Units Maximum Daily Emissions, lb/day	All Units Maximum Annual Emissions, lbs/yr	All Units Annual Emissions, ton/yr
NOx	0.0100	1.30	1.73	634.7	0.32	1.30	1.73	634.7	0.32
CO	0.0370	4.82	6.41	2348.4	1.17	4.82	6.41	2348.4	1.17
VOC	0.0040	0.52	0.69	253.9	0.13	0.52	0.69	253.9	0.13
SOx	0.0030	0.39	0.52	190.4	0.10	0.39	0.52	190.4	0.10
PM10	0.0070	0.91	1.21	444.3	0.22	0.91	1.21	444.3	0.22
PM2.5	0.0070	0.91	1.21	444.3	0.22	0.91	1.21	444.3	0.22
	lbs/MMbtu								
CO2	116.95000	15242.09	20271.98	7422899.53	3711.45	15242.09	20271.98	7422899.53	3711.45
Methane	0.01300	1.69	2.25	825.12	0.41	1.69	2.25	825.12	0.41
N2O	0.00022	0.03	0.04	14.00	0.01	0.03	0.04	14.00	0.01
CO2e								*short tons*	3722.3
								metric tons	3383.9

Notes:
(1) natural gas criteria pollutant EF factors
(2) Based on maximum hourly heater fuel use of 130.33 MMBtu/hr/boiler
and fuel HHV of 1010 Btu/scf gives 0.1290 MMscf/hr/boiler.
(3) Based on maximum annual heater fuel use of 63,471 MMBtu/yr/boiler
and fuel HHV of 1010 Btu/scf gives 62.8423 MMscf/yr/boiler.
(4) PM2.5 = PM10

Refs:
(1) EFs Rentech Boiler Systems, 1-3-13
(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.
(3) LNBs/FGR operational during SU/SD
(4) SCR assumed not functional during SU/SD

Exh Flow	114988.00	lbs/hr
Exh Flow	38502.00	acfm
Exh Temp	300.00	deg F
Exh Vel	60.77	ft/sec
Stk Ht	45.00	ft.
Stk Diam	44.00	in.

Nox is the only pollutant affected during SU/SD modes.

Normal steady state (SS) Nox, lbs/hr:	0.73
SU, lbs/hr:	1.30
SD lbs/hr:	1.30

Scenario	SU, mins	SS, mins	SD, mins
1	30	30	0
2	30	20	10
3	0	50	10

Scenario	Nox, lbs/hr
1	1.02
2	1.12
3	0.83

Attachment 3.1A-1
Boiler Specification Data

Emissions Data

		Natural Gas
DESCRIPTION	UNITS	
System Performance		
Steam Flow	Lb/hr	100,000
Steam Pressure	PSIG	155
Steam Temperature	ºF	500
System Efficiency (HHV)	%	83.63
Stack Gas Temperature	ºF	300
Stack Gas Flow	Lbs/hr	114988
Stack Gas Flow	ACFM	38502
Stack Diameter	in	44"
Stack Exit Velocit	Ft/sec	60.77
Stack Height	Ft	45
Furnace Volume	Ft^3	1709
Total Heat Input (HHV)	MMBtu/Hr	130.33
Fuel Flow	Lbs/Hr	5485
Fuel Higher Heating Value	Btu/SCF	1010
	Btu/lb	23761
Emissions		
NOx	Lbs/MMBtu	0.01
	PPM	9.0
	Lbs/hr	1.41
CO	Lbs/MMBtu	0.037
	PPM	50
	Lbs/hr	4.82
PM/PM-10/PM-2.5	Lbs/MMBtu	0.007
	Lbs/hr	0.91
VOC	Lbs/MMBtu	0.004
	PPM	10
	Lbs/hr	0.52
SOx	Lbs/MMBtu	0.003

Notes:

1. Feedwater temperature to boiler is 227°F.
2. Ambient temperature is 80°F.
3. Emissions guarantees are from 25% to 100% MCR only.

Rentech Boiler Systems, Inc.
Abilene Facility: 5025 E. Business 20 • Abilene, TX 79601 • Phone: 325-672-3400 • Fax: 325-672-9996
Lincoln Office: 145 North 46th Street • Lincoln, NE 68503 • Phone: 402-474-4242 • Fax: 402-474-4243

Appendix 3.1B
Modeling Support Data

APPENDIX 3.1B

Modeling Support Data

Tables presented in this Appendix are as follows:

3.1B-1	Aux Boiler Operations Impact Summary
3.1B-2	Construction Impact Summary
3.1B-3	Historical Air Quality Monitoring Summary for Sutter County
3.1B-4	Proposed Building Dimensions and Height Data

In addition, this appendix contains the following Figures:

3.1B-1	Proposed Facility Plot Plan
3.1B-2	BPIP Modeling Structure Map
3.1B-3	Coarse and Fine Receptor Grids
3.1B-4	Monitoring Station Map
3.1B-5	Wind Roses (Quarterly and Annual, 5 Pages)

Modeling input/output files are included in the enclosed CD's.

TABLE 3.1B-1 Air Quality Impact Summary for Normal Operating Conditions

Pollutant	Avg. Period	Maximum Concentration ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Class II Significance Level ($\mu g/m^3$)	Ambient Air Quality CAAQS/NAAQS	
						($\mu g/m^3$)	($\mu g/m^3$)
NO_2[a]	1-hour Federal	49.74	84.6	134.34	7.5	-	188
	1-hour State	105.01	137.5	242.51	-	339	-
	Annual	1.18	15.7	16.89	1	57	100
PM10	24-hour	8.19	54.6	62.79	5	50	150
	Annual	1.89	22.4	24.29	1	20	-
PM2.5	24-hour	6.25	36.5	42.75	1.2	-	35
	Annual[b]	1.89	13.8	15.69	0.3	-	15
	Annual[c]	1.89	7.9	9.79	0.3	12	-
CO	1-hour	540.83	3543	4083.83	2000	23,000	40,000
	8-hour	94.28	2189	2283.28	500	10,000	10,000
SO_2	1-hour	8.40	7.9	16.30	7.8	655	196
	3-hour	5.88	7.9	13.78	25	-	1,300
	24-hour	3.51	5.3	8.81	5	105	367

[a] Ambient Ratio Method (ARM) used for annual NO_2 impacts with 75 percent ratio and Ozone Limiting Method (OLM) used for 1-hour NO_2 impacts, with Kearny Mesa NO_2 background included in the modeling results (USEPA-default 2008–2010 hourly-seasonal background used for 1-hour federal NAAQS and SDAPCD-provided 2003–2005 hourly NO_2 concurrent with meteorological data used for 1-hour state CAAQS. The 1-hour SIL is an interim value.

[b] Federal annual PM2.5 standard

[c] State annual PM2.5 standard

Construction Impact Summary Table 3.1B-2 (not included)

Construction impact modeling was not performed for the activities associated with the installation of the auxiliary boiler and addition of the cells to the dry cooling tower due to the short duration of the construction period, and the low emissions from construction activities.

Sacramento Valley Air Basin

County: Sutter

Table 3.1B-3
Historical AQ Data

OZONE (ppm)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Peak 8-Hour Indicator (State)	0.108	0.107	0.100	0.095	0.102	0.114	0.109	0.110	0.107	0.106	0.106	0.104	0.104	0.100	0.103	0.109	0.108	0.097	0.095	0.095
Avg. of 4th High 8-Hr. in 3 Yrs (Nat)	0.095	0.091	0.082	0.076	0.082	0.082	0.085	0.096	0.096	0.091	0.091	0.089	0.089	0.083	0.084	0.088	0.090	0.083	0.082	0.081
Peak 1-Hour Indicator (State)	0.128	0.123	0.121	0.105	0.111	0.126	0.123	0.120	0.115	0.114	0.120	0.116	0.115	0.108	0.113	0.121	0.120	0.106	0.100	0.102
4th High 1-Hr. in 3 Yrs2	0.140	0.140	0.120	0.100	0.110	0.120	0.120	0.115	0.115	0.109	0.124	0.124	0.124	0.106	0.117	0.117	0.117	0.113	0.102	0.102
Max. 8-Hr. Concentration	0.103	0.087	0.083	0.095	0.108	0.108	0.100	0.103	0.102	0.092	0.102	0.097	0.092	0.093	0.103	0.099	0.089	0.083	0.097	0.085
Maximum 1-Hr. Concentration	0.150	0.100	0.110	0.110	0.120	0.140	0.115	0.126	0.116	0.105	0.124	0.115	0.108	0.116	0.117	0.117	0.100	0.096	0.110	0.098
Days Above State 8-Hr. Std.	77	22	13	28	69	37	88	54	81	25	53	62	33	28	38	38	24	20	44	19
Days Above Nat. 8-Hr. Std.	58	12	5	17	45	26	57	36	58	12	39	41	20	14	23	24	12	5	25	8
Days Above State 1-Hr. Std.	41	4	2	10	29	13	25	21	28	5	16	21	9	6	15	10	2	1	6	2

PM_{10} ($\mu g/m^3$)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Max. 24-Hr. Concentration (State)		103	96	108	79	78	154	128	82	98	63	151	70	82	75	83	53	60	66	54
Max. 24-Hr. Concentration (Nat)		103	96	108	79	78	154	128	82	98	60	150	70	80	74	81	53	59	63	51
Max. Annual Average (State)			38.5	39.2	35.2	31.2			29.9	28.8	24.5	39.4		30.5	31.8	26.4		25.0		
Max. Annual Average (Nat)		37.9	38.5	38.5	34.3	30.7	34.5	30.4	29.8	28.6	23.8	38.4	27.9	30.2	30.9	26.0	20.0	24.7	23.0	19.7
Calc Days Above State 24-Hr Std			74	104	61	43			27	22	30	62		50	25	31		31		
Calc Days Above Nat 24-Hr Std			0	0	0	0	0		0	0	0	0	0	0	0	0		0		0

$PM_{2.5}$ ($\mu g/m^3$)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Max. 24-Hr. Concentration (State)											69.0	58.0	44.0	56.0	62.0	32.0	41.0	47.2	51.6	55.8
Max. 24-Hr. Concentration (Nat)											66.0	56.0	44.0	56.0	62.0	32.0	39.0	45.0	42.0	45.0
98th Percentile of 24-Hr Conc.											66.0	56.0	38.0	54.0	34.0	29.0	38.0	42.0	41.0	34.0
Annual Average (State)												15.9	11.2	11.9	13.1	9.4	10.1	10.2	11.2	
Avg. of Qtrly. Means (Nat)												16.3	10.6	11.9	13.6	9.5	10.0	9.5	11.3	8.2

CARBON MONOXIDE (ppm)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Peak 8-Hr. Indicator				10.2	8.1	5.8	5.7	5.2	4.8	4.6	4.4	4.4	4.4	4.6	4.2	3.6	3.1	2.8	2.9	
Max. 1-Hr. Concentration				12.0	9.0	10.0	8.8	7.5	7.7	6.1	7.3	7.2	6.1	17.2	6.4	4.3	5.8	4.4	3.1	
Max. 8-Hr. Concentration				8.5	6.3	7.3	6.1	4.7	4.7	4.1	4.9	4.4	3.6	3.9	3.5	2.4	2.5	3.4	2.3	
Days Above State 8-Hr. Std.				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Days Above Nat. 8-Hr. Std.				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

NITROGEN DIOXIDE (ppm)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Peak 1-Hr. Indicator				0.108	0.089	0.088	0.086	0.083	0.079	0.077	0.075	0.081	0.079	0.082	0.075	0.078	0.075	0.071	0.065	0.062
Max. 1-Hr. Concentration				0.100	0.090	0.090	0.075	0.074	0.068	0.073	0.074	0.085	0.072	0.079	0.068	0.080	0.066	0.062	0.070	0.054
Max. Annual Average (Nat)					0.017	0.017	0.016	0.013	0.012	0.014	0.013	0.014	0.013	0.014	0.015	0.014	0.012	0.012	0.012	0.012
Max. Annual Average (State)					0.017	0.017	0.016	0.013	0.012	0.014	0.013	0.014			0.015	0.014	0.012	0.012	0.011	0.012

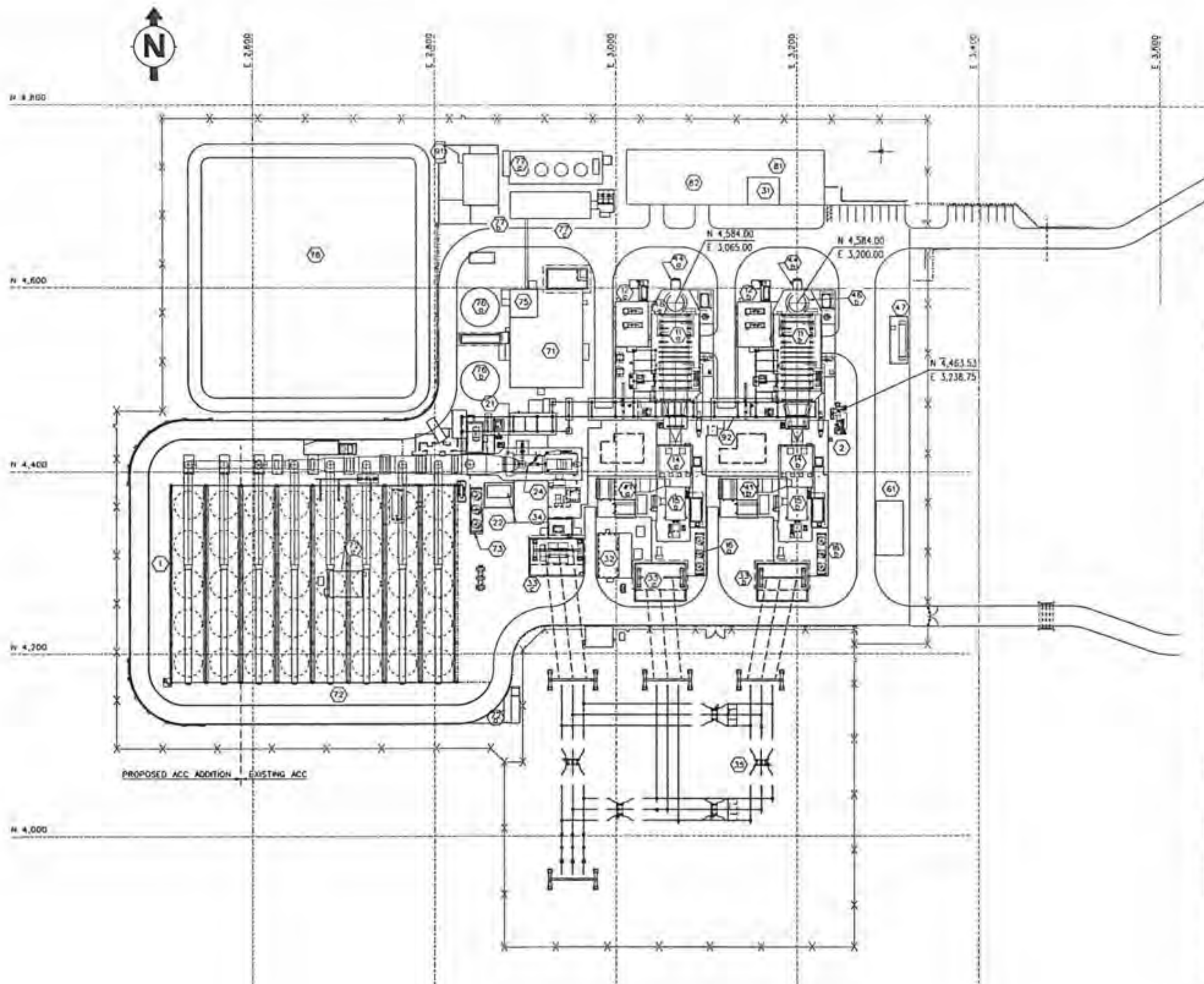
SULFUR DIOXIDE (ppm)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Peak 1-Hr. Indicator																				
Max. Annual Average																				
Max. 24-Hr. Concentration																				

No Monitoring Data Available

Table A-72

Table 3.1B-4

Calpine Sutter Energy Center						
Equipment Dimensions and Locations for Air Dispersion Modeling						
Refer to WorleyParsons Document CASU-0-SK-111-002-001 Revision A						12/17/2012
		Dimensions				
#	Structure	Length	Width	Height	Plant Coordinates (NE Corner)	Notes
11a	HRSG 1	127'	30'	90'	N 4,572.06 E 3,082.52	Elevation is at Drum Platform Level
11b	HRSG 2	127'	30'	90'	N 4,572.06 E 3,217.52	Elevation is at Drum Platform Level
46a	HRSG 1 Stack		18' dia	145'	N 4,584.00 E 3,065.00	Center of Stack
46b	HRSG 2 Stack		18' dia	145'	N 4,584.00 E 3,200.00	Center of Stack
14a	CTG 1 Enclosure	45'	35'	21'	N 4,427.83 E 3,081.90	
14b	CTG 2 Enclosure	45'	35'	21'	N 4,427.83 E 3,216.90	
24	STG Enclosure	38'	20'	34'	N 4,409.83 E 2,915.03	
32	Switchgear Building	50'	37'	15'	N 4,332.02 E 3,002.62	
71	Water Treatment Building	106'	80'	25'	N 4,597.92 E 2,962.93	
72	ACC	320'	216'	114'	N 4,386.48 E 2,824.96	Including New ACC Addition
76a	Filtered/Fire Water Storage Tank		43' dia.	41'	N 4,579.00 E 2,850.00	Center of Tank
76b	Demineralizer Storage Tank		43' dia.	41'	N 4,499.00 E 2,850.00	Center of Tank
77b	Crystallizer	31'	20'	25'	N 4,689.50 E 2,870.50	
77c	Evaporator	89'	29'	55'	N 4,704.50 E 2,971.75	
81	Admin Building / Control Room	110'	60'	25'	N 4,751.00 E 3,230.00	
2	Auxiliary Boiler	26'	12'	19'	N 4,476.73 E 3,254.73	New Equipment
2	Auxiliary Boiler Stack		3.5' dia	50' (minimum)	N 4,463.53 E 3,238.75	Center of Stack, New Equipment



LEGEND

No.	EXISTING EQUIPMENT
11a	HEAT RECOVERY STEAM GENERATOR (HRSG) 1
11b	HEAT RECOVERY STEAM GENERATOR (HRSG) 2
12a	BOILER FEED PUMPS 1
12b	BOILER FEED PUMPS 2
14a	COMBUSTION TURBINE 1
14b	COMBUSTION TURBINE 2
15a	COMBUSTION TURBINE GENERATOR 1
15b	COMBUSTION TURBINE GENERATOR 2
16a	LUBE OIL COOLER 1
16b	LUBE OIL COOLER 2
21	STEAM TURBINE AREA
22	STEAM TURBINE LUBE OIL SKID
24	STEAM TURBINE
31	CONTROL ROOM
32	SWITCHGEAR BLDG W/ BATTERY ROOM
33a	C.T. MAIN TRANSFORMER 1
33b	C.T. MAIN TRANSFORMER 2
33c	S.T. MAIN TRANSFORMER
34	AUXILIARY TRANSFORMER
35	SWITCHYARD
41a	AIR INLET FILTER 1
41b	AIR INLET FILTER 2
44a	CONTINUOUS EMISSIONS MONITORING SYSTEM 1
44b	CONTINUOUS EMISSIONS MONITORING SYSTEM 2
46a	STACK 1
46b	STACK 2
47	AMMONIA TANK
61	GAS REGULATING AREA (BY OTHERS)
71	WATER TREATMENT BLDG/LABORATORY
72	AIR COOLED CONDENSER
72a	AIR COOLED CONDENSER ELECTRICAL BUILDING
72b	AIR COOLED CONDENSER OIL STORAGE AREA
73	LUBE OIL COOLER
75	FIRE WATER AND SERVICE WATER PUMP AREA
76a	FILTERED/FIRE WATER STORAGE TANK
76b	DEMINERALIZED WATER STORAGE TANK
77a	WASTE WATER BASIN
77b	CRYSTALLIZER
77c	EVAPORATOR SYSTEM
78	STORM WATER DETENTION/RETENTION AREA
81	ADMINISTRATION BLDG
82	WAREHOUSE/MAINTENANCE SHOP
91	SEWAGE TREATMENT PLANT
92	PIPE RACK

LEGEND

No.	NEW EQUIPMENT
1	AIR COOLED CONDENSER ADDITION
2	AUXILIARY BOILER

0 60 120 180 240FT

REV	DATE	DESCRIPTION
A	12/17/12	ISSUED FOR REVIEW

PRELIMINARY STATUS — DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.

APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

ORIGINATING PERSONNEL

DRAWN BY: D. MRKACEK
CHECKED BY:
LEAD DESIGNER: D. MRKACEK
ENGINEER/TECH SPECIALIST: J. LINDER
PROJECT ENGINEERING MANAGER: C. PRATT
PROJECT MANAGER:

PROFESSIONAL ENGINEERS SEAL

Zero Harm — Leadership, No Incidents, Safe Behaviour

WorleyParsons
resources & energy

CLIENT/PROJECT TITLE: CALPINE SUTTER

GENERAL ARRANGEMENT
OVERALL SITE PLAN

SCALE: 1"=60'-0"
DRAWING SIZE: ARCH D (36" x 24")
WORLEYPARSONS DWG. NO.: CASU-0-SK-111-002-001
REV: A

Figure 3.1B-1

Figure 3.1B-2 BPIP Location Map

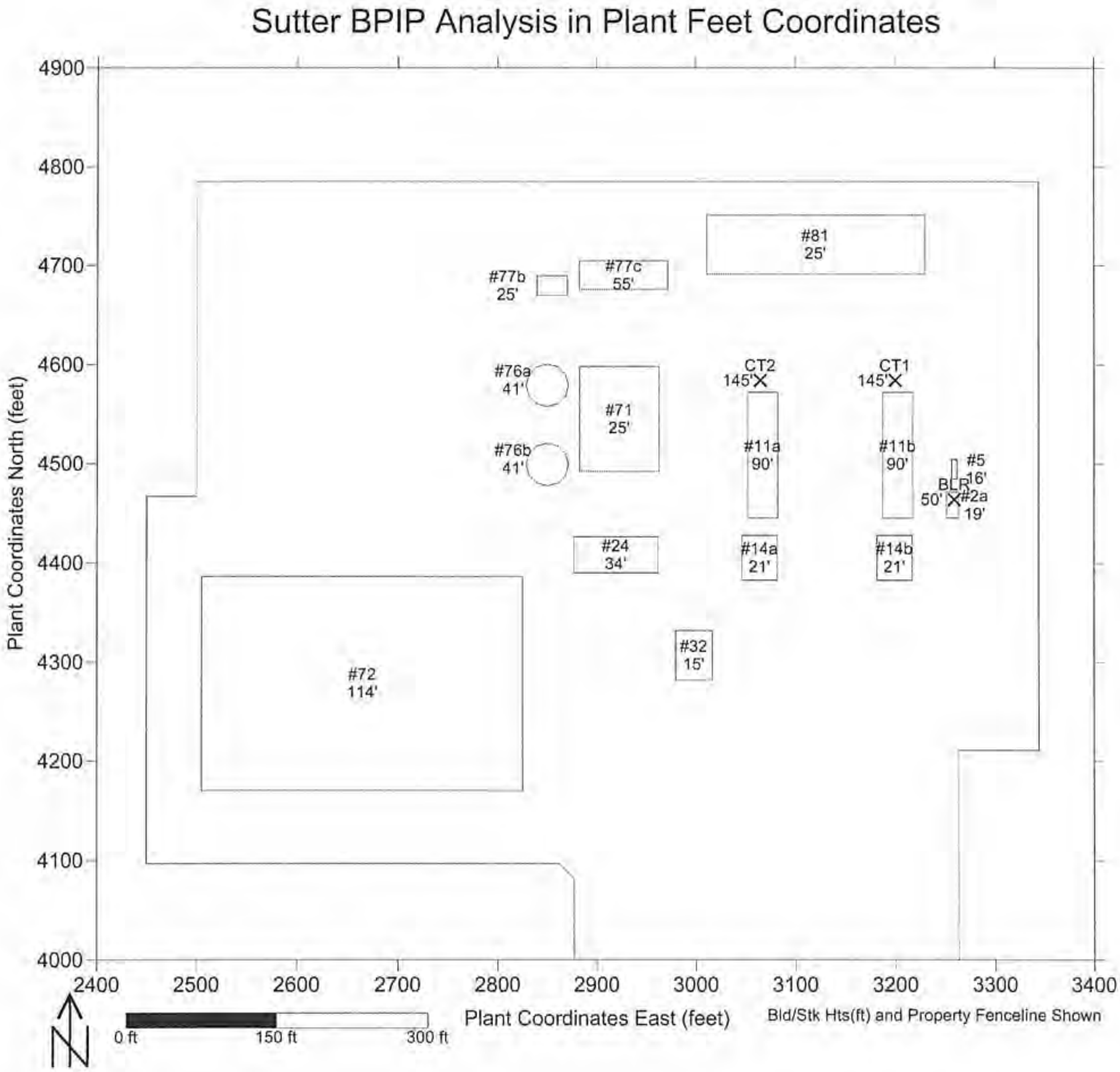


Figure 3.1B-3 SEC RECEPTOR GRIDS

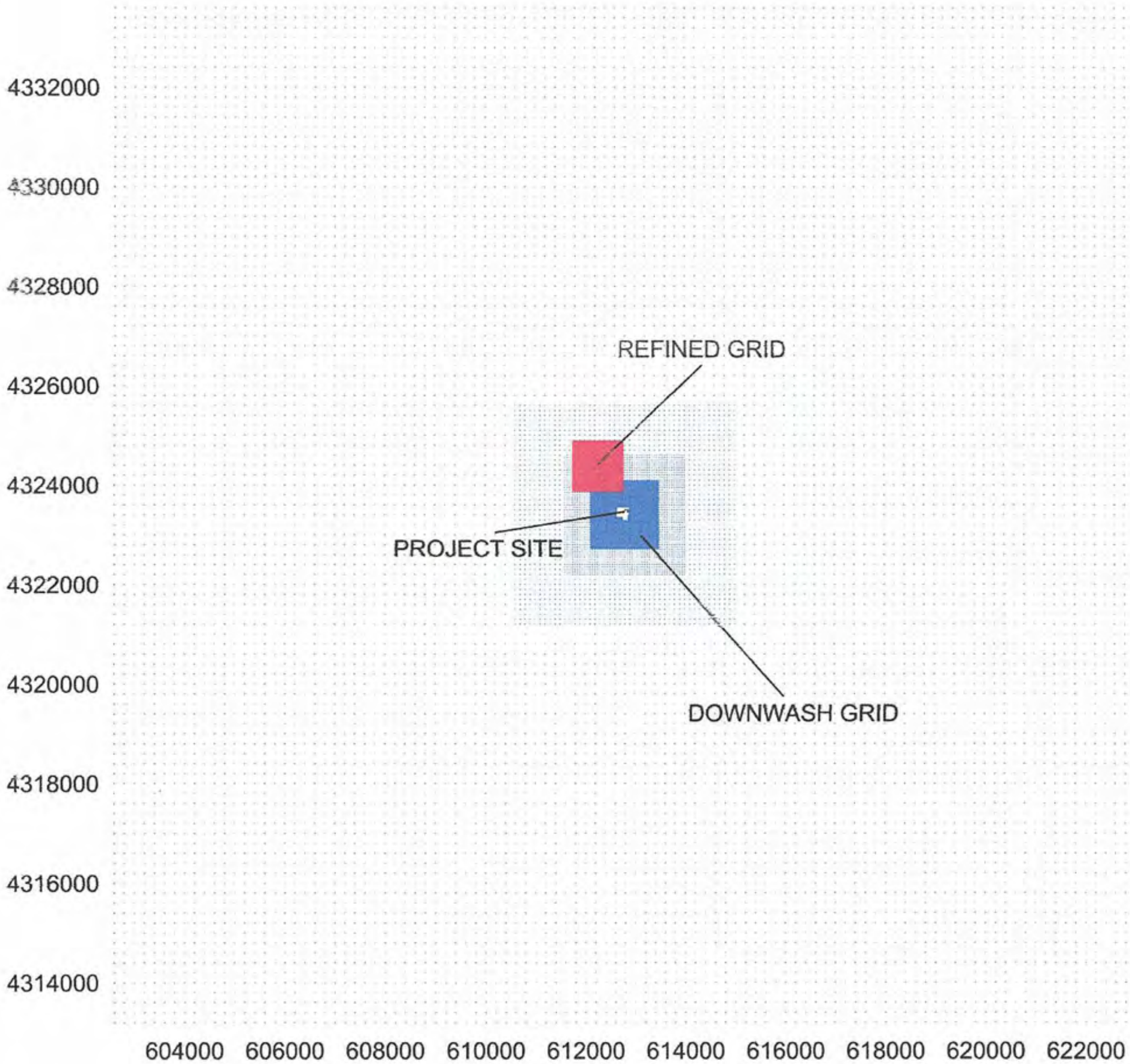
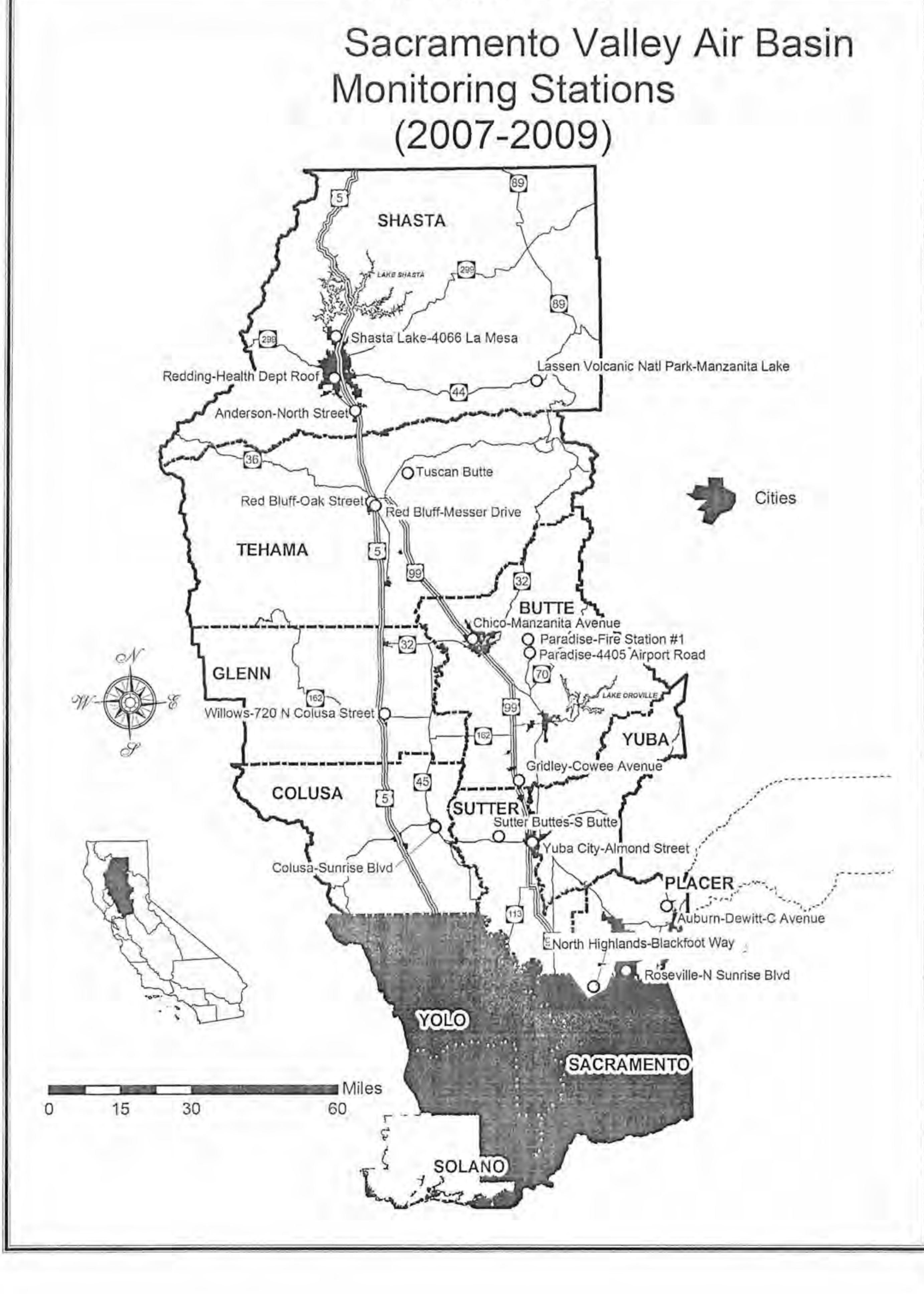


Figure 3.1B-4
Monitoring Station Map



Appendix 3.1C
Modeling Protocol

APPENDIX 3.1C

Protocol for Increments Analysis

Overview of Requirements for Increments Analysis

The federal Prevention of Significant Deterioration (PSD) program is intended to ensure that economic growth in areas with good air quality occurs without causing the deterioration of that air quality to unhealthful levels. The PSD program contains a number of requirements that apply to new or modified sources of air pollution that are located in clean air areas.

The SEC facility currently has a valid PSD permit issued by EPA Region IX.

Although the FRAQMD has adopted Rule 10-10 (PSD), this rule has yet to be approved in the SIP. Therefore the FRAQMD does not at this time have delegation of PSD. As such, any required PSD permit application addressing the proposed modifications will be submitted to EPA Region IX for processing.

The PSD program requirements, applied on a pollutant-specific basis, include conducting an increments analysis to demonstrate that no increments will be exceeded as a result of the proposed new or modified source.

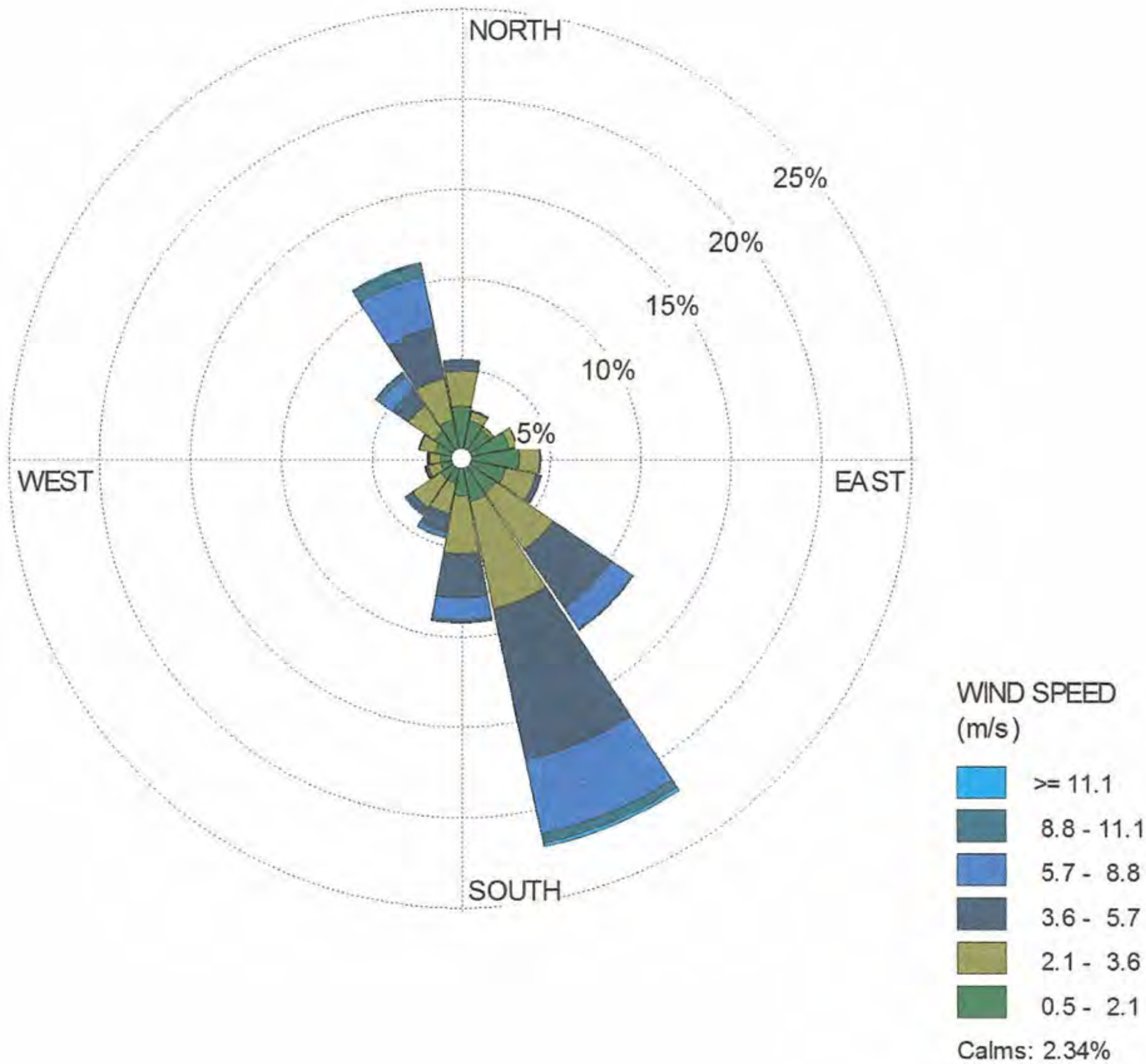
The SEC project is not expected to trigger the modification requirements of the PSD program. Therefore, an increment analysis will not be performed as part of the PSD permit application to be submitted to EPA Region IX.

A formal modeling protocol is not being proposed for the addition of aux boiler. The modeling and impact analysis in Section 3.1 presents all the relevant details on the modification project impact analysis.

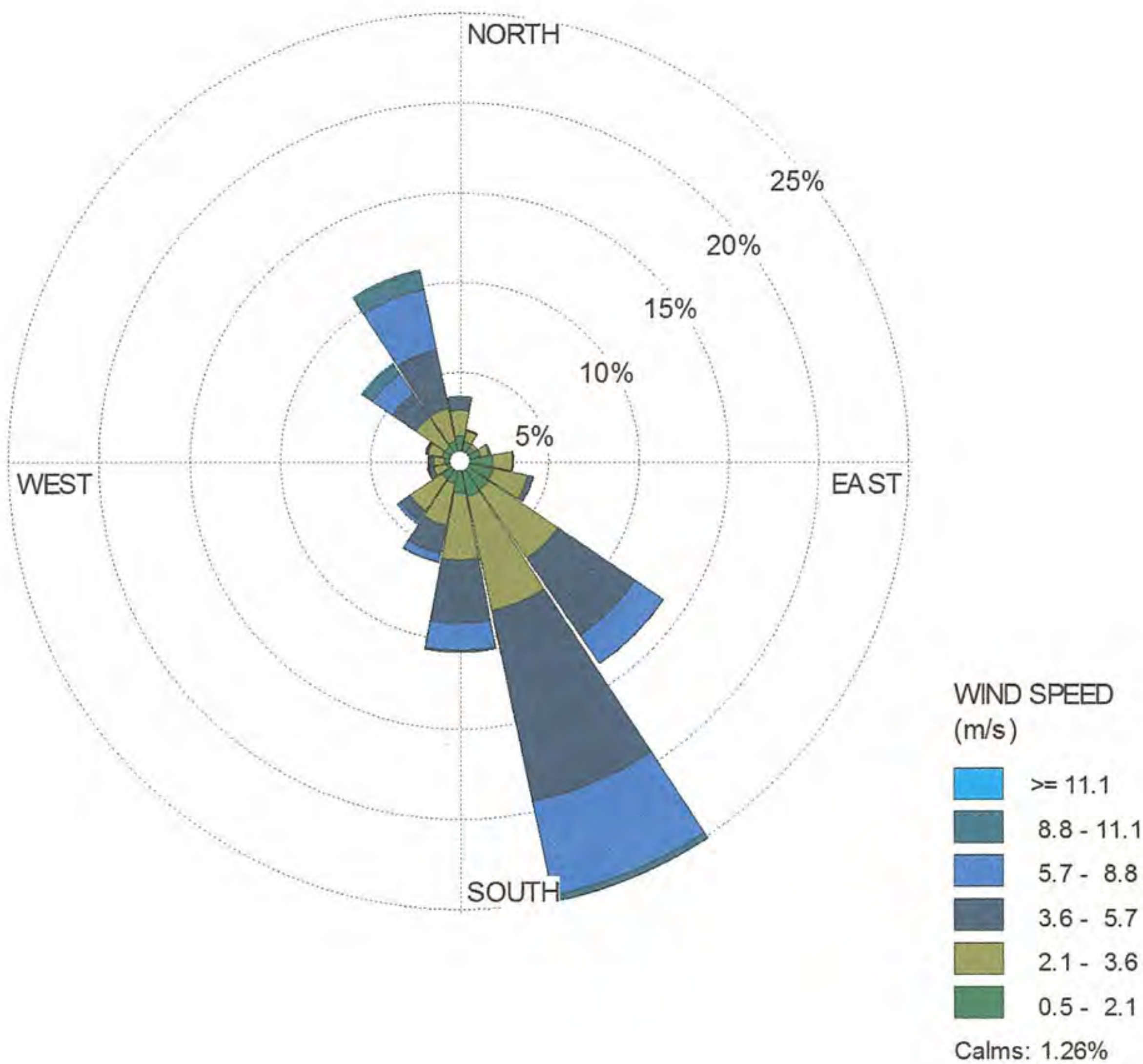
Figure 3.1B-5 Wind Roses for Sutter Modeling (5 Pages)

Yuba County Airport 2007-2011

Annual

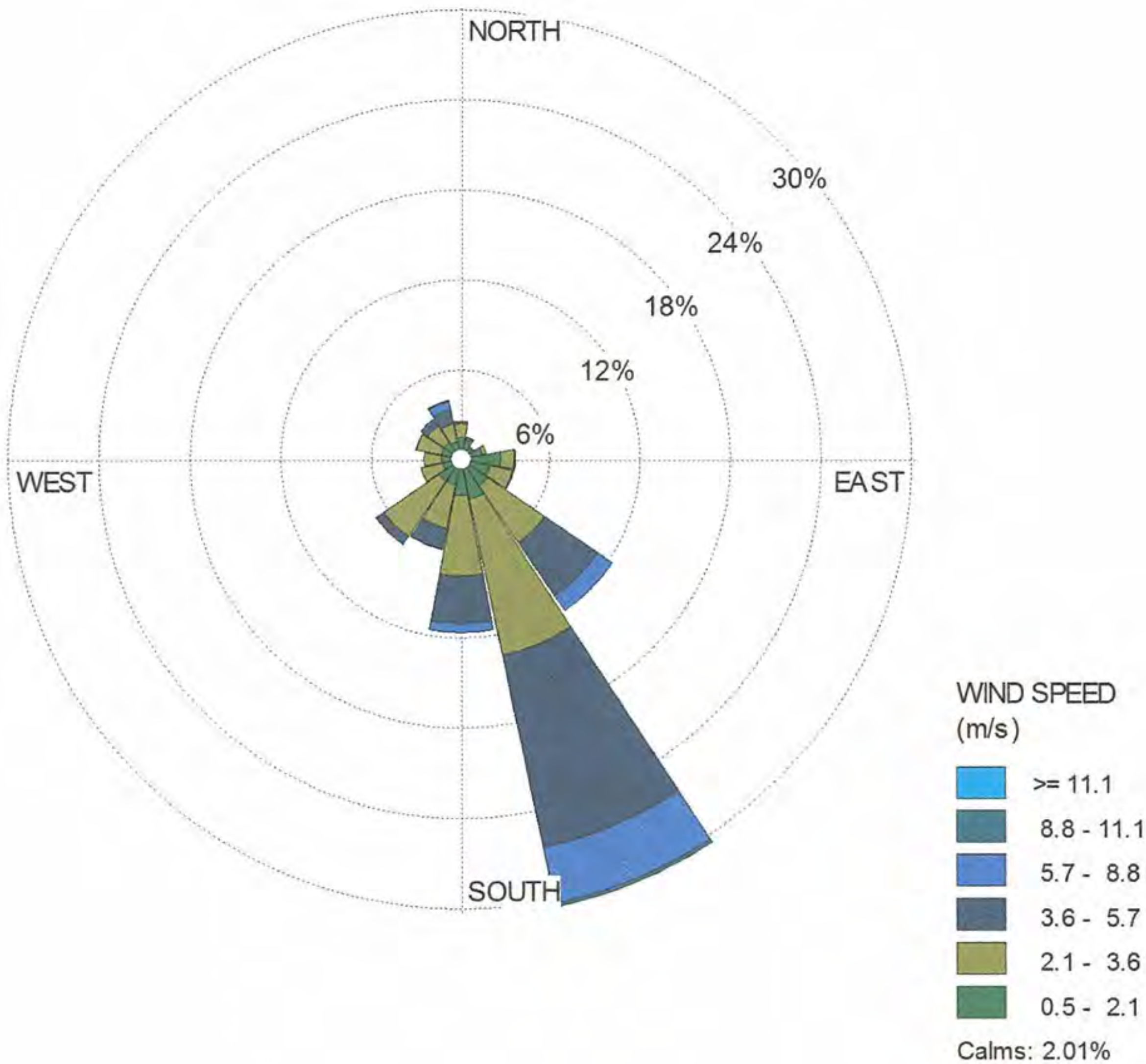


Spring

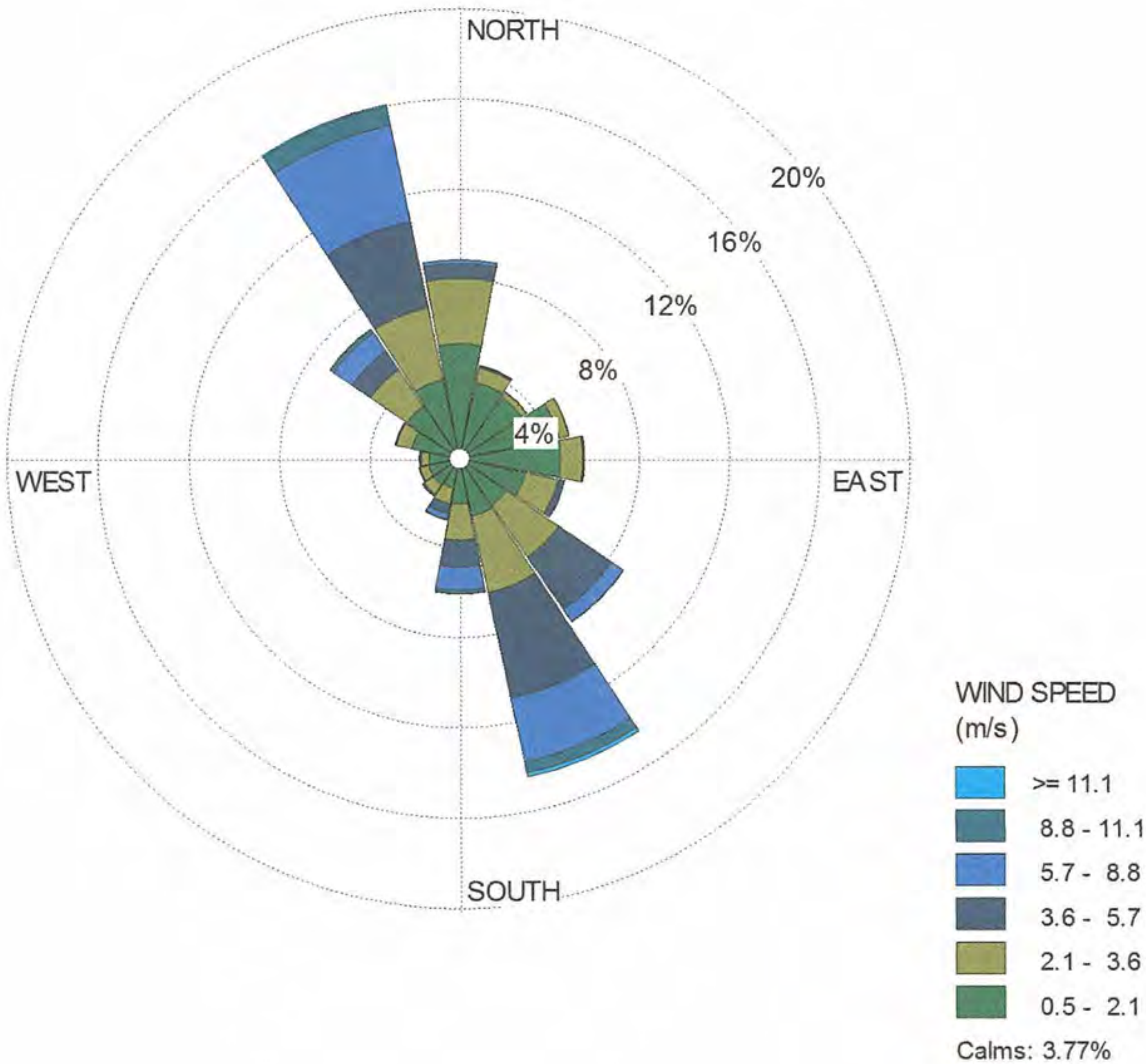


NORTH
SOUTH
EAST
WEST
5%
10%
15%
20%
25%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 1.26%

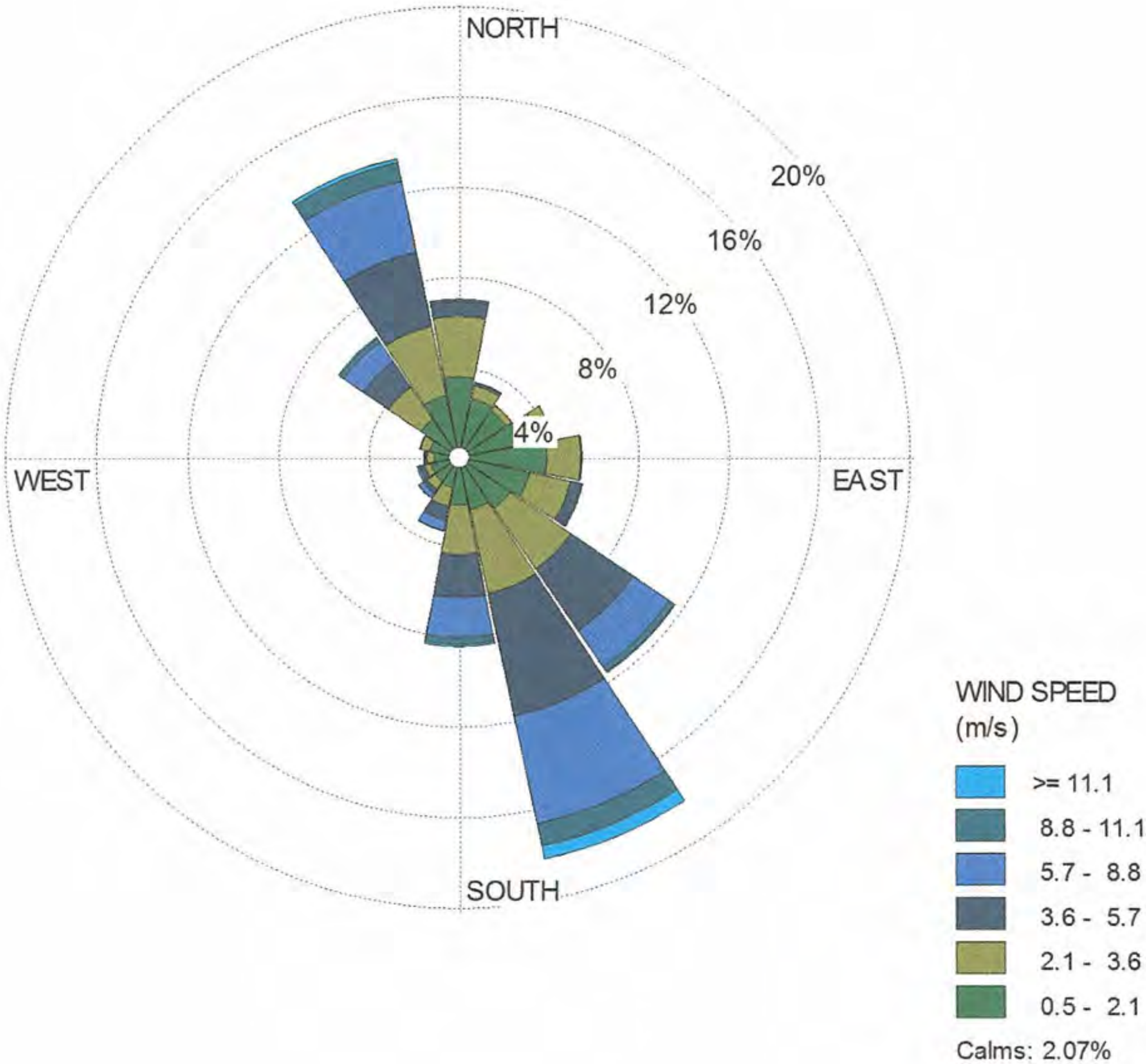
Summer


NORTH
SOUTH
WEST
EAST
6%
12%
18%
24%
30%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 2.01%

Fall


NORTH
SOUTH
EAST
WEST
4%
8%
12%
16%
20%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 3.77%

Winter



NORTH
SOUTH
WEST
EAST
4%
8%
12%
16%
20%
WIND SPEED
(m/s)
>= 11.1
8.8 - 11.1
5.7 - 8.8
3.6 - 5.7
2.1 - 3.6
0.5 - 2.1
Calms: 2.07%

Appendix 3.1D
Construction Emissions and Support Data

APPENDIX 3.1D

Construction Emissions and Impact Analysis

Construction Phases

Construction of SEC proposed modification is expected to last approximately 9 months. The construction will occur in the following four main phases:

- Site preparation;
- Foundation work;
- Construction/installation of major structures, equipment, and linears.

Construction Schedule

The construction sequence for power plant construction includes the following general steps: (1) mobilization, (2) site preparation and grading, (3) foundation construction, (4) major equipment installation including aux boiler and ACC unit cells, (5) balance of plant construction, (6) testing and commissioning. The typical work week will be approximately 5 days/week, 39 weeks/year (9 months), at a range of 10 hours/day. This schedule yields approximately 198 work days/year.

The total onsite construction related acreage is ~1.5 acres, i.e., the pad area for the aux boiler and the area of the new cells on the ACC unit. This area also includes the small area needed for internal access road re-alignment and fence repositioning. The maximum acreage disturbed on any one day during onsite construction will be 1 acre. Although the site is essentially flat, the site will require slight grading and leveling prior to construction of the aux boiler and ACC cells. Site preparation includes finish grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence. The project will also include the construction of a new gas line (offsite). The offsite construction emissions for this line are included in the emissions summary, but are not included in the impact analysis.

Fugitive dust emissions from the construction of SEC will result from:

- Dust entrained during site preparation and finish grading/excavation at the construction site and the gas line ROW;
- Dust entrained during offsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;

- Exhaust from Diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and,
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily dust emissions are expected to occur during the first months of construction when site preparation occurs. The worst-case daily exhaust emissions are expected to occur during the middle of the construction schedule during the installation of the major mechanical equipment. Annual emissions are based on the average equipment mix and use rates during the construction period. Daily emissions are derived from the annual values using the estimated construction time frame.

Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of SEC:

- The applicant will have an on-site construction mitigation manager who will be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the proposed construction mitigations will be provided on a periodic basis.
- All unpaved roads and disturbed areas in the project and laydown construction sites will be watered as frequently as necessary to control fugitive dust. The frequency of watering will be on a minimum schedule of four (4) times during the daily construction activity period. Watering may be reduced or eliminated during periods of precipitation.
- Onsite vehicle speeds will be limited to <15 miles per hour on unpaved areas within the project construction site.
- The construction site entrance(s) will be posted with visible speed limit signs.
- All construction equipment vehicle tires will be inspected and cleaned as necessary to be free of dirt prior to leaving the construction site via paved roadways.
- Gravel ramps will be provided at the tire cleaning area.
- All unpaved exits from the construction site will be graveled or treated to reduce track-out to public roadways.

- All construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been provided.

- Construction areas adjacent to any paved roadway will be provided with sandbags or other similar measures as specified in the construction Storm Water Pollution Prevention Plan (SWPPP) to prevent runoff to roadways.

- All paved roads within the construction site will be cleaned on a periodic basis (or less during periods of precipitation), to prevent the accumulation of dirt and debris.

- The first 500 feet of any public roadway exiting the construction site will be cleaned on a periodic basis (or less during periods of precipitation), using wet sweepers or air filtered dry vacuum sweepers, when construction activity occurs or on any day when dirt or runoff from the construction site is visible on the public roadways.

- Any soil storage piles and/or disturbed areas that remain inactive for longer than 10 days will be covered, or shall be treated with appropriate dust suppressant compounds.

- All vehicles that are used to transport solid bulk material on public roadways and that have the potential to cause visible emissions will be covered, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to minimize fugitive dust emissions. A minimum freeboard height of two (2) feet will be required on all bulk materials transport.

- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition will remain in place until the soil is stabilized or permanently covered with vegetation.

- Disturbed areas will be re-vegetated as soon as practical.

To mitigate exhaust emissions from construction equipment, the applicant is proposing the following:

- The applicant will work with the construction contractor to utilize to the extent feasible, EPA-ARB Tier 2/Tier 3 engine compliant equipment for equipment over 100 horsepower.

- Insure periodic maintenance and inspections per the manufacturer's specifications.

- Reduce idling time through equipment and construction scheduling.

- Use California low sulfur diesel fuels (<=15 ppmw S).

Estimation of Emissions with Mitigation Measures

Tables 3.1D-1 through 3.1D-3 show the estimated average daily and annual onsite heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures. Detailed emission calculations are included in Table 3.1D-5. The emissions of greenhouse gases (GHG) during construction are presented in Table 3.1D-5.

TABLE 3.1D-1 AVERAGE DAILY ONSITE EMISSIONS DURING CONSTRUCTION, POUNDS PER DAY*

	NO_x	CO	VOC	SO_x	$PM_{10}/PM_{2.5}$
Construction Fugitive Dust	0	0	0	0	.62/.092
Equipment and Vehicle Exhaust	39.5	24.7	6.7	.1	2.6/2.6
Total =	39.5	24.7	6.7	.1	**3.22/2.69**

TABLE 3.1D-2 AVERAGE ANNUAL ONSITE EMISSIONS DURING CONSTRUCTION, TONS PER PERIOD (9 MONTHS)

	NO_x	CO	VOC	SO_x	$PM_{10}/PM_{2.5}$
Construction Fugitive Dust	0	0	0	0	.04/.007
Equipment and Vehicle Exhaust	3.92	2.45	.66	.01	.25/.25
Total =	3.92	2.45	.66	.01	**.29/.26**

TABLE 3.1D-3 ANNUAL OFFSITE EMISSIONS DURING CONSTRUCTION, TONS PER CONSTRUCTION PERIOD (9 MONTHS)

	NO_x	CO	VOC	SO_x	$PM_{10}/PM_{2.5}$
Construction Fugitive Dust	0	0	0	0	.104/.012
Equipment and Vehicle Exhaust	.722	2.35	.263	.004	.044/.041
Total =	.722	2.35	.263	.004	**.148/.053**

Analysis of Ambient Impacts from Facility Construction

Given the small amount of construction emission associated with the amendment, no ambient air quality impacts from emissions during the construction of SEC were estimated.

Attachment - Detailed Emission Calculations

Table 3.1D-5 Construction Emissions Calculations (~29 pages)

Table 3.1D-5

Construction Emissions Calculations and Support Data

29 pages

Construction Emissions Summary

On-site Fugitive Dust	PM10 lbs/day	PM10 tons/period	PM2.5 lbs/day	PM2.5 tons/period
Prep/grading/cut-fill/ etc.	0.27	0.0199	0.06	0.0042
Paved road dust	0.01	0.00045	0	0.000075
Unpaved road dust	0.33	0.02	0.03	0.003
Storage pile dust-windblown	0.006	0.0001	0.002	0.0001
Summation	*0.616*	*0.040*	*0.092*	*0.007*
tpy normalized		*0.040*		*0.007*

Notes:

1. tpy values are presented as normalized values based upon the known length of the construction period (months converted to years).

Known construction period (months): 12
(if less than 12 months, enter 12)
Normalization factor for tpy: 1.00

Off-site Fugitive Dust	PM10 lbs/day	PM10 tons/period	PM2.5 lbs/day	PM2.5 tons/period
Paved road dust	1.19	0.09	0.2	0.01
Trackout	0.085	0.01	0.0143	0.0011
Gas line	0.12	0.004	0.03	0.0008
***	0	0	0	0
Summation	*1.395*	*0.104*	*0.244*	*0.012*
tpy normalized		*0.104*		*0.012*

On-site Equipment Exhaust	PM10 lbs/day	PM10 tons/period	PM2.5 lbs/day	PM2.5 tons/period	Nox lbs/day	Nox tons/period	CO lbs/day	CO tons/period	VOC lbs/day	VOC tons/period	SOx lbs/day	SOx tons/period
Construction equipment	2.6	0.25	2.6	0.25	39.5	3.92	24.7	2.45	6.7	0.66	0.1	0.01
***	0	0	0	0	0	0	0	0	0	0	0	0
***	0	0	0	0	0	0	0	0	0	0	0	0
***	0	0	0	0	0	0	0	0	0	0	0	0
Summation	*2.6*	*0.25*	*2.6*	*0.25*	*39.5*	*3.92*	*24.7*	*2.45*	*6.7*	*0.66*	*0.1*	*0.01*
tpy normalized		*0.250*		*0.250*		*3.920*		*2.450*		*0.660*		*0.010*

Off-site Equipment Exhaust	PM10 lbs/day	PM10 tons/period	PM2.5 lbs/day	PM2.5 tons/period	Nox lbs/day	Nox tons/period	CO lbs/day	CO tons/period	VOC lbs/day	VOC tons/period	SOx lbs/day	SOx tons/period
Delivery trucks	0.2	0.01954	0.17	0.0167	5.41	0.5357	5.01	0.4959	0.68	0.0676	0.006	0.0006
Worker commute travel	0.24	0.024	0.24	0.024	1.88	0.186	18.72	1.854	1.97	0.195	0.03	0.003
***	0	0	0	0	0	0	0	0	0	0	0	0
***	0	0	0	0	0	0	0	0	0	0	0	0
Summation	*0.440*	*0.044*	*0.410*	*0.041*	*7.290*	*0.722*	*23.730*	*2.350*	*2.650*	*0.263*	*0.036*	*0.004*
tpy normalized		*0.044*		*0.041*		*0.722*		*2.350*		*0.263*		*0.004*

CONSTRUCTION PHASE - Site Preparation and Construction

MRI Level 2 Analysis (Refs 1, 3-7)

Acres Subject to Construction Grading/Earthwork Disturbance Activites:		1.55	
Max Acres Subject to Construction Disturbance Activites on any day:		1	
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.0144	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	10	
	Days/Wk:	5	
	Days/Month:	22	
	Const Period, Months:	9	0.8 years
	Const Period, Days:	198	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03)		
	Mean # days/year with rain >= 0.01 inch:	90	
	Mean # months/yr with rain >= 0.01 inch:	3.00	
	Adjusted Const Period, Months:	6.75	
	Adjusted Const Period, Days:	131	
Controls for Fugitive Dust:			
	Proposed watering cycle:	3	times per day

SCAQMD Mitigation Measures, Table XI-A, 4/07

3 watering cycles/10 hour construction shift yields a 61% reduction, 2 watering cycles/10 hour shift should yield a 40%+ reduction.

Speed control of onsite const traffic from 35 to 15 mph yields a 57% reduction (use 50% control as conservative value).

Calculated % control based on mitigations proposed:	81	% control
Conservative control % used for emissions estimates:	80	% control
	0.2	release fraction

Emissions: Controlled	PM10	PM2.5
tons/month	0.003	0.001
tons/period	0.019	0.004
Max lbs/day	0.3	0.055

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:	12000
Total tons of soil handled:	31032
Total days soil handled:	131
Tons soil/avg day:	238
Control Eff, watering, %	80
Release Fraction:	0.2

Mean annual wind speed, mph:				5.6
Avg. Soil moisture, %:				10
Avg. Soil density, tons/cu.yd:				1.3
k factor for PM10:				0.35
Number of Drops per ton:				2
Calc 1	wind			1.159
Calc 2	moisture			9.518
Calc 3	int			0.122
Calc 4	PM10	lb/ton		0.0001
PM2.5 fraction of PM10:				0.210

Emissions:	PM10	PM2.5
tons/period	0.00	0.00
tons/month	0.00	0.00
max lbs/day	0.01	0.00

Emissions Totals:

	PM10	**PM2.5**
tons/period	**0.0199**	**0.0042**
tons/month	**0.0030**	**0.0006**
max lbs/day	**0.27**	**0.06**

Methodology References:

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report factor of 0.011 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of 220 hrs/month, the adjusted EF would be 0.0144 tons/acre/month.
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Beale AFB (1961-1970 data), CSWC-Carb ADD, June 1984, Page D-12.
(9) Soil silt data: Assumed 10%.
(10) Soil Moisture: Assumed 10%.

CONSTRUCTION PHASE - Underground Gas Line

MRI Level 2 Analysis (Refs 1, 3-7)

Acres Subject to Construction Disturbance Activites:		4.27	note 11
Max Acres Subject to Construction Disturbance Activites on any day:		0.4	
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.0144	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	10	
	Days/Wk:	5	
	Days/Month:	22	
	Const Period, Months:	4	0.3 years
	Const Period, Days:	88	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03)		
	Mean # days/year with rain >= 0.01 inch:	90	
	Mean # months/yr with rain >= 0.01 inch:	3.00	
	Adjusted Const Period, Months:	3.00	
	Adjusted Const Period, Days:	58	
Controls for Fugitive Dust:			
	Proposed watering cycle:	3	times per day

SCAQMD Mitigation Measures, Table XI-A, 4/07

3 watering cycles/10 hour construction shift yields a 61% reduction, 2 watering cycles/10 hour shift should yield a 40% + reduction.

Speed control of onsite const traffic from 35 to 15 mph yields a 57% reduction (use 50% control as conservative value).

Calculated % control based on mitigations proposed:	81	% control
Conservative control % used for emissions estimates:	80	% control
	0.2	release fraction

Emissions: Controlled	PM10	PM2.5
tons/month	0.001	0.000
tons/period	0.003	0.001
Max lbs/day	0.1	0.022

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:	14043
Total tons of soil handled:	36315.198
Total days soil handled:	58
Tons soil/day:	626
Control Eff, watering, %	80
Release Fraction:	0.2

Mean annual wind speed, mph:				5.6
Avg. Soil moisture, %:				10
Avg. Soil density, tons/cu.yd:				1.3
k factor for PM10:				0.35
Number of Drops per ton:				2
Calc 1	wind			1.159
Calc 2	moisture			9.518
Calc 3	int			0.122
Calc 4	PM10	lb/ton		0.0001
PM2.5 fraction of PM10:				0.210

Emissions:	PM10	PM2.5
tons/period	0.001	0.000
tons/month	0.000	0.000
max lbs/day	0.017	0.004

Emissions Totals:

	PM10	**PM2.5**
tons/period	**0.0040**	**0.0008**
tons/month	**0.0013**	**0.0003**
max lbs/day	**0.12**	**0.03**

Methodology References:

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report factor of 0.011 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of 220 hrs/month, the adjusted EF would be 0.0144 tons/acre/month.
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Beale AFB (1961-1970 data), CSWC-Carb ADD, June 1984, Page D-12.
(9) Soil silt data: Assumed 10%.
(10) Soil Moisture: Assumed 10%.
(11) acreage based on trench ROW dimensions = 4.27 acres
(12) cut and fill based on trench dimensions = 14043 cu.yds.

ONSITE PAVED ROAD FUGITIVE DUST EMISSIONS
(associated with construction equipment traffic)

Length of Paved Road used for/by Construction Access:		0.1	miles*		
Avg weight of construction vehicular equipment on road:		6.1	tons (range 2 - 42 tons)		
Road surface silt loading factor:		0.06	g/m2 (range 0.03 - 400 g/m2)		
Particle size multiplier factors:	PM10	0.016	lb/VMT		
	PM2.5	0.0024	lb/VMT		
C factors (brake and tire wear):	PM10	0.00047	lb/VMT		
	PM2.5	0.00036	lb/VMT		
Avg construction vehicle speed on onsite road:		10	mph (range 10-55 mph)		
Number of construction vehicles per day:		49	**	VMT/day:	4.9
				VMT/month:	107.8
Number of construction work days per month:		22		VMT/period:	727.65
Total vehicles per month:		1078			
Number of construction work months:		6.75	adjusted for precip events		
Total vehicles per const period:		7276.5			

	PM10	
Calc 1	0.060	
Calc 2	1.764	
Calc 3	0.0012	lb/VMT

Emissions	PM10	PM2.5
lbs/day	0.01	0.00
lbs/month	0.13	0.02
lbs/period	0.90	0.15
tons/period	0.00	0.00

*total mileage of onsite paved roads. Since these roads will be used to access the power block areas and portions of the heliostat fields under installation, it was assumed that all of these roads would be used on an average daily basis.
** delivery vehicles plus onsite const support equipment, worker vehicles will not be traversing the site
EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169

ONSITE UNPAVED ROAD FUGITIVE DUST

Length of Unpaved Road used for/by Construction Access:		0.1	miles*			
Avg weight of construction vehicular equipment on road:		6.1	tons (range 2 - 42 tons)			
Road surface silt content:		10	% (range 1.8 - 35%), rolled gravel surface			
Road surface material moisture content:		10	% (range 0.03 - 13%)			
		k	a	c	d	
Particle size multiplier factors:	PM10	1.8	1	0.2	0.5	
	PM2.5	0.18	1	0.2	0.5	
C factors (brake and tire wear):	PM10	0.00047	lb/VMT			
	PM2.5	0.00036	lb/VMT			
Avg construction vehicle speed on road:		5	mph (range 10-55 mph)			
Number of construction vehicles per day:		49	**		VMT/day:	4.9
					VMT/month:	107.8
Number of construction work days per month:		22			VMT/period:	727.65
Total vehicles per month:		1078				
Number of construction work months:		6.75				
Total vehicles per const period:		7276.5				
Control reduction due to watering, speed control, etc. =		80				
		0.8				
Release Fraction =		0.2				

	PM10	PM2.5
Calc 1	0.833	0.833
Calc 2	0.408	0.408
Calc 3	1.821	1.821
Calc 4	0.336	0.034
Uncontrolled lb/VMT	0.336	0.033

Emissions	PM10	PM2.5
lbs/day	0.33	0.03
lbs/month	7.24	0.72
lbs/period	48.88	4.84
tons/period	0.02	0.00

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg, USGS, OFR-02-348, ADRS, 2002.
Soil data: AECOM BSPP, App E.2, 8/09. DR-Air-3, 1-6-10, Silt content-18% avg
*no offsite unpaved roads will be used during construction
** delivery and worker vehicles plus support staff

OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS

(associated with delivery truck and worker vehicle traffic on Hwy 99 and plant access roads)

Average mileage for construction related vehicles:		47.5	miles, roundtrip distance***		
Avg weight of vehicular equipment on road:		6.1	tons (range 2 - 42 tons)		
Road surface silt loading factor:		0.03	g/m2 (range 0.03 - 400 g/m2) Limited Access Freeway > 10,000 ADT (I-10)		
Particle size multiplier factors:	PM10	0.016	lb/VMT		
	PM2.5	0.0024	lb/VMT		
C factors (brake and tire wear):	PM10	0.00047	lb/VMT		
	PM2.5	0.00036	lb/VMT		
Avg vehicle speed on road:		55	mph		
Number of vehicles per day:		49	*	VMT/day:	2327.5
				VMT/month:	51205
Number of work days per month:		22		VMT/period:	345633.75
	Total vehicles per month:	1078			
Number of work months:		6.75	adjusted for precip events		
	Total vehicles per const period:	7276.5			

	PM10	
Calc 1	0.035	
Calc 2	1.764	
Calc 3	0.0005	lb/VMT

Emissions	PM10	PM2.5
lbs/day	1.19	0.20
lbs/month	26.15	4.42
lbs/period	176.53	29.83
tons/period	0.09	0.01

*see vehicle total on Weight tab

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.

PM2.5 fraction of PM10 per CARB CEIDARs is 0.169

*** Note: weighted avg roundtrip distance from delivery data supplied by Applicant.

Delivery Route: see delivery data page.

CONSTRUCTION PHASE - Trackout Emissions

Paved Road Length (miles):	0.1	estimated roundtrip trackout distance				
Daily # of Vehicles:	15					
Avg Vehicle Weight (tons):	22.0			**PM10**	**PM2.5***	
Total Unadjusted VMT/day	1.5			0.361		
Particle Size Multipliers	PM10			4.923		
lb/VMT	0.023			0.008	0.0014	lb/VMT
C factor, lb/VMT	0.00047			0.085	0.0143	**lbs/day**
Road Sfc Silt Loading (g/m^2):	0.56	local X 2		0.001	0.0002	**tons/month**
# of Active Trackout Points:	1	**		0.01	0.0011	**tons/period**
Added Trackout Miles:	PM10					
Trackout VMT/day:	9		*Default Silt Load Values for Paved Road Types*			
Final Adjusted VMT/day	11			Freeway	0.02 g/m2	
Final Adjusted VMT/month	231			Arterial	0.036 g/m2	
Final Adjusted VMT/period	1559			Collector	0.036 g/m2	
Construction days/month:	22			Local	0.28 g/m2	
Adj. Construction months/period:	6.75			Rural	1.6 g/m2	
Control Applied to Trackout:	Sweeping and Cleaning (water washing)					
Control Efficiency, %	80	0.8	Release Factor =	0.2		

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.

** 1 controlled ingress/egress point is planned for site construction

EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.

Use silt loading factor from default values for road type if no site specific data is available.

Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.

Plant access road is currently paved.

Vehicle count = delivery trucks plus 5 misc support vehicles X 2

Worker vehicles not counted for trackout, as they do not access main site.

Fugitive Dust from Wind Erosion of Soil Storage Piles

Grading Phase Only for Aux Boiler and ACC

Avg acres of soil storage piles exposed per day:	0.1	*	
Soil silt content, %:	10		0.1
Number of days/year with precipitation >0.01 inches:	90		
Annual % of time wind speed greater than 12 mph:	20.6		0.206
Watering control efficiency, %:	80		0.8
PM10 aerodynamic factor:	0.5		
PM2.5 aerodynamic factor:	0.2		
Total construction period exposure time, days:	45		

	lb/acre-day	lbs/day	lbs/period	tons/period
PM10	0.057	0.006	0.3	0.0001
PM2.5	0.023	0.002	0.1	0.0001

MDAQMD, Emissions Inventory Guidance, Mineral Handling and Processing Industries, April 2000.
USEPA, AP-42, Section 13.2.2, Unpaved Roads, Figure 13.2.2-1, Thornethwaite Precipitation Data.
*soil storage areas only, open cut and fill areas are not soil storage areas.

Average Vehicle Weight Estimate for Construction Period

Vehicle Type	Weight tons	Avg # Vehicles per day	Avg Frac. of total vehicles	
Passenger LDP/LDT	2.5	44	0.815	Worker and support travel vehicles
HDD Loaded	35	4	0.074	
HDD Unloaded	15	4	0.074	Materials delivery trucks, service
MDGT Loaded	15	1	0.019	trucks, fuel trucks, other misc trucks.
MDGT Unloaded	5	1	0.019	
		54	1.000	
Vehicle Total		49		

Weighted Avg Vehicle Weight, tons : 6.1

Ref: AP-42, Section 13.2.2, 11/06, mean vehicle weight guidance, p.13.2.2-6.

Delivery Vehicles Only			
HDD Loaded	35	4	0.400
HDD Unloaded	15	4	0.400
MDGT Loaded	15	1	0.100
MDGT Unloaded	5	1	0.100
		10	1

Weighted Avg Vehicle Weight, tons : 22

WorleyParsons
resources & energy

Calpine Sutter CCGT Construction Labor and Equipment Loading
DRAFT By: Lory Widmer

			Number of craft												
			Month												
		Hrs/day	1	2	3	4	5	6	7	8	9	10	11	12	
Work															total hrs
Civil work for ACC		8	8	8											2816
ACC		8			12	25	38	38	30	30					30448
Steam blows and ACC commissioning		16									6				2112
Aux boiler foundation		8		4	2										1056
Mechanical tie-ins for aux boiler installation		8				6	6	4							2816
Aux boiler installation		8							8	9.31					3047
HRSG modifications		8							56	59					20240
Terminal attemperators		8							8						1408
Install (electric) startup fuel gas heater		8		2				4	4						1760
TOTAL CRAFT			**8**	**14**	**14**	**31**	**44**	**46**	**106**	**98.31**	**6**	**0**	**0**	**0**	**65703**
Total hours			1408	2464	2464	5456	7744	8096	18656	17303	2112	0	0	0	
STAFF															
CM STAFF (SR)			1	1	1	1	1	1	1	1	1				
TA				1	1	1	1	2	3	3	2				
STAFF TOTAL			**1**	**2**	**2**	**2**	**2**	**3**	**4**	**4**	**3**	**0**	**0**	**0**	
TOTAL PROJECT			**9**	**16**	**16**	**33**	**46**	**49**	**110**	**102.31**	**9**	**0**	**0**	**0**	
Vehicle Trips	One way vehichle Trips		18	32	32	66	92	98	220	205	18	0	0	0	

Peak One Way Vehicle Trips	**220**	**Days per month:**	22
Average One Way Vehicle Trips	**87**	**Total Const days:**	198

Number of Onsite Power Plant Construction Equipment	Fuel	Hrs/day	Number of Eq onsite												Rated
			Month												
			1	2	3	4	5	6	7	8	9	10	11	12	HP
Air Compressor, Ingersoll-Rand	Diesel	8													50
Asphalt Paver, Cat	Diesel	8	1	1	1	1									120
Scrapers, Cat	Diesel	8													175
Dozer, Cat	Diesel	8	1	1											250
Blade, Cat	Diesel	8	1	1											175
Backhoe, Cat,	Diesel	8													120
Excavator, Cat	Diesel	8		1	1										120
Compactor, Cat	Diesel	8	2	4	3										50
Crane, 150-Ton, Manitowoc	Diesel	8			1	1	1	1	2	2					175
Crane, 20-Ton Grove	Diesel	8													50
Crane, 225-Ton, Manitowoc	Diesel	8													250
Crane, 40-Ton, Grove	Diesel	8				1	1	1							120
Loader, Cat,	Diesel	8	2	2											120
Truck, Concrete Pump, Reed	Diesel	8		1	1										50
Welder, Multiquip, BLW-300SS	Diesel	8				2	2	2	2	2					50
Welder, Multiquip, GA 3800	Gasoline	8				2	2	2	2	2					25
Haul Truck (Ford F-150 or eq.)	Gasoline	8	1												175
Manlift	Diesel	8			2	4	4	4	3	3	2				120
Concrete Vibrator	Diesel	8		2	2										15
Onsite Dump Truck	Diesel	8		1	1										250
Onsite Water Truck	Diesel	8	2	2	1	1									250
Onsite Welding Truck	Diesel	8													175
Onsite Cement Truck	Diesel	8													175
Onsite Flatbed Truck	Diesel	8		1	1										175

Notes

1. Schedule based on 22 working day month
2. Information is conceptual and high level, based on information available.
3. Emissions factors from SCAQMD Off-road Const database for calendar year 2013.

Assumptions:

1. Existing roadways will be used to deliver backfill and fencing materials to site
2. Backfill quarry is sufficient (volume and quality)
3. Quarry to jobsite distance is 20 miles
4. Geotechnical report is available

Exclusions:

1. Laydown yard and on site facilities
2. Slope protection and drainage
3. SWPPP
4. Permit(s)

Total EQ.	Total	2013 Emissions Factors, lbs/hp-hr						Emissions, lbs/construction period					
Months	Hp-Hrs	VOC	CO	Nox	SOx	PM10	CO2	VOC	CO	Nox	SOx	PM10	CO2
0	0	0.001841	0.005091	0.004442	5.76E-06	0.00044	0.445425	0.0	0.0	0.0	0.0	0.0	0.0
4	84480	0.000906	0.003299	0.005468	5.33E-06	0.000478	0.454162	76.5	278.7	461.9	0.5	40.4	38367.6
0	0	0.001183	0.005204	0.008894	9.52E-06	0.000505	0.846136	0.0	0.0	0.0	0.0	0.0	0.0
2	88000	0.000706	0.002	0.006378	7.48E-06	0.000245	0.664526	62.1	176.0	561.3	0.7	21.6	58478.3
2	61600	0.000838	0.004197	0.006396	7.97E-06	0.000361	0.708123	51.6	258.6	394.0	0.5	22.2	43620.4
0	0	0.001068	0.003903	0.006552	6.34E-06	0.000557	0.540793	0.0	0.0	0.0	0.0	0.0	0.0
2	42240	0.000905	0.004314	0.005659	7.2E-06	0.000489	0.613526	38.2	182.2	239.1	0.3	20.6	25915.3
9	79200	0.002049	0.005823	0.005165	6.72E-06	0.000489	0.519663	162.3	461.1	409.1	0.5	38.8	41157.3
8	246400	0.000589	0.002755	0.004439	5.17E-06	0.000254	0.459112	145.2	678.8	1093.8	1.3	62.7	113125.2
0	0	0.00203	0.005783	0.004788	5.99E-06	0.000479	0.463734	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0.000416	0.001179	0.003979	5.05E-06	0.00014	0.448635	0.0	0.0	0.0	0.0	0.0	0.0
3	63360	0.000766	0.003015	0.00459	4.9E-06	0.000411	0.4179	48.5	191.0	290.8	0.3	26.0	26478.1
4	84480	0.000809	0.00346	0.005013	5.76E-06	0.000438	0.490946	68.3	292.3	423.5	0.5	37.0	41475.1
2	17600	0.002104	0.006232	0.006457	8.88E-06	0.00055	0.686697	37.0	109.7	113.6	0.2	9.7	12085.9
10	88000	0.001959	0.005506	0.005069	6.71E-06	0.000479	0.519161	172.4	484.6	446.1	0.6	42.2	45686.2
10	44000	0.000831	0.002325	0.00408	5.73E-06	0.000252	0.451444	36.6	102.3	179.5	0.3	11.1	19863.6
1	30800	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
22	464640	0.000365	0.001813	0.002323	3.05E-06	0.000201	0.260208	169.6	842.6	1079.4	1.4	93.3	120902.9
4	10560	0.000496	0.002573	0.003131	6.56E-06	0.000142	0.421348	5.2	27.2	33.1	0.1	1.5	4449.4
2	88000	0.00056	0.001535	0.004949	7.5E-06	0.000165	0.666182	49.3	135.0	435.5	0.7	14.5	58624.0
6	264000	0.00056	0.001535	0.004949	7.5E-06	0.000165	0.666182	147.8	405.1	1306.6	2.0	43.5	175871.9
0	0	0.000823	0.004332	0.005888	8.04E-06	0.000344	0.714787	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0.000823	0.004332	0.005888	8.04E-06	0.000344	0.714787	0.0	0.0	0.0	0.0	0.0	0.0
2	61600	0.000823	0.004332	0.005888	8.04E-06	0.000344	0.714787	50.7	266.8	362.7	0.5	21.2	44030.9
						Totals:	lbs/period	1321.4	4892.0	7830.1	10.1	506.3	870132.0
							tons/period	0.66	2.45	3.92	0.01	0.25	435.1

Emissions, lbs/construction day (average)					
VOC	CO	Nox	SOx	PM10	CO2
0.00	0.00	0.00	0.000	0.00	0.0
0.39	1.41	2.33	0.002	0.20	193.8
0.00	0.00	0.00	0.000	0.00	0.0
0.31	0.89	2.83	0.003	0.11	295.3
0.26	1.31	1.99	0.002	0.11	220.3
0.00	0.00	0.00	0.000	0.00	0.0
0.19	0.92	1.21	0.002	0.10	130.9
0.82	2.33	2.07	0.003	0.20	207.9
0.73	3.43	5.52	0.006	0.32	571.3
0.00	0.00	0.00	0.000	0.00	0.0
0.00	0.00	0.00	0.000	0.00	0.0
0.25	0.96	1.47	0.002	0.13	133.7
0.35	1.48	2.14	0.002	0.19	209.5
0.19	0.55	0.57	0.001	0.05	61.0
0.87	2.45	2.25	0.003	0.21	230.7
0.18	0.52	0.91	0.001	0.06	100.3
0.00	0.00	0.00	0.000	0.00	0.0
0.86	4.26	5.45	0.007	0.47	610.6
0.03	0.14	0.17	0.000	0.01	22.5
0.25	0.68	2.20	0.003	0.07	296.1
0.75	2.05	6.60	0.010	0.22	888.2
0.00	0.00	0.00	0.000	0.00	0.0
0.00	0.00	0.00	0.000	0.00	0.0
0.26	1.35	1.83	0.003	0.11	222.4
6.7	24.7	39.5	0.1	2.6	4394.6

Construction Related Deliveries amd Emissions Estimates

Item	Total # deliveries	Delivery Days	Deliveries per day
ACC	100	110	1.0
Boiler	4	22	0.0
Civil	800	20	40.0
FG heater	2	2	1.0
Max deliveries per day			40
Avg deliveries per day			5

Total const days:	198
Total deliveries:	951
Total VMT/period:	45187
Total VMT/day (avg):	228

During the peak month, the estimated number of construction staff daily one-way trips is 220.
The greatest number of truck trips expected during construction of the project in the peak construction month is approximately 40 daily one-way truck trips
All deliveries assumed to be by HDDT.
EFs derived from SCAQMD EMFAC 2007 database, V 2.3, (SCAQMD website) for 2013

Construction traffic distribution

45 percent of trips would come from Yuba City/Marysville area, roundtrip distance, miles:	20
55 percent would come from northern Sacramento urban region, roundtrip distance, miles:	70
Weighted Average distance, miles:	47.5

Emissions Factors, lbs/VMT:	
CO	0.02195
Nox	0.02371
VOC	0.002993
SOx	0.0000257
PM10	0.000856
PM2.5	0.000739
CO2	2.71943

Emissions,lbs/construction period

CO	Nox	VOC	SOx	PM10	PM2.5	CO2
991.8	1071.4	135.2	1.2	38.7	33.4	122882.2

Emissions, lbs/construction day (average)

CO	Nox	VOC	SOx	PM10	PM2.5	CO2
5.01	5.41	0.68	0.006	0.20	0.17	620.62

CONSTRUCTION PHASE - Worker Travel - Emissions

Ref: SCAQMD, Emfac 2007, Ver. 2.3
On Road Passenger Vehicles (1969-2013)
Composite Emissions Factors

Worker Travel to Site

Avg Occupancy/Vehicle:	1	
Avg Roundtrip Distance, miles:	60	
Avg # of Workers at Site, per day:	44	note 3
Avg Daily Worker VMT:	2640	
Max # of Workers at Site, per day:	110	note 4
Max Daily Worker VMT:	6600	
Total Const Days:	198	
Total Const Period Worker VMT:	522720	

Emissions Factors (lbs/VMT)

NOx	CO	VOC	SOx	PM10	CO2
0.0007116	0.0070922	0.0007456	0.0000107	0.0000907	1.1009

Daily Emissions (lbs)

	NOx	CO	VOC	SOx	PM10	CO2	PM2.5
Avg	1.88	18.72	1.97	0.03	0.24	2906.38	0.24
Max	4.70	46.81	4.92	0.07	0.60	7265.94	0.60

Tons per Const Period

	NOx	CO	VOC	SOx	PM10	CO2	PM2.5
Avg	0.186	1.854	0.195	0.003	0.024	287.7	0.024

1. avg roundtrip worker distance is a 30 mile radius from plant site or 60 miles/day.
2. carpooling is not considered
3. avg workers per day over 9 month period
4. max workers per day during month 7

CO2e Emissions Estimates

	Total All Construction Phases	
For CO2 Estimated Emissions Only	0	
Total CO2 emisisons from diesel combustion:	496.5	tons/period
Total CO2 emissions from gasoline combustion:	287.7	tons/period
Approximate methane fraction of CO2 for diesel combustion:		0.000051
Approximate N2O fraction of CO2 for diesel combustion:		0.000032
Approximate methane fraction of CO2 for gasoline combustion:		0.000213
Approximate N2O fraction of CO2 for gasoline combustion:		0.000113
Estimated methane from diesel combustion:	0.0253215	tons/period
Estimated N2O from diesel combustion:	0.015888	tons/period
Estimated methane from gasoline combustion:	0.0612801	tons/period
Estimated N2O from diesel combustion:	0.0325101	tons/period
Estimated methane CO2e from diesel combustion:	0.5317515	tons/period
Estimated N2O CO2e from diesel combustion:	4.92528	tons/period
Estimated methane CO2e from gasoline combustion:	1.2868821	tons/period
Estimated N2O CO2e from gasoline combustion:	10.078131	tons/period

Partial CO2e emissions from construction: 801 tons/period

For GHG Where All Species are Estimated

CO2	0	tons/period
CH4	0	tons/period
N2O	0	tons/period

Adjusted GWP Rates

CO2	0	tons/period
CH4	0	tons/period
N2O	0	tons/period
CO2e	0	tons/period

Total CO2e emissions from construction: 801 tons/period

728 metric tons/period

CCAR General Protocol, January 2009, Version 3.1.

IPCC SAR values for methane and N2O.

Calpine Sutter Civil Construction Estimate

A. Excavation Quantities and Activities for Site Development

Total Fill required for site boundary expansion	12,000	Cubic Yards
Total time to deliver fill	20	Days
Truck volume per load	15	Cubic Yards
Volume of fill delivered per day	600	Cubic Yards
Truck loads per day	40	Per Day
Total trucks delivering loads per day	10	Trucks
Total time to spread and compact fill	10	Days
Total time for fencing expansion area (precast footings)	5	Days
Total time for Civil Post work	5	Days

Total time for all civil improvement work	40	Days

Required Equipment for Civil Improvements

Grader	1	Diesel
Sheeps foot roller	1	Diesel
Vibratory compactor	1	Diesel
Bobcat	1	Diesel
Haul Trucks for Fill for 20 Days	10	Diesel
D6 Bulldozer	1	Diesel
Front end loader	1	Diesel
Asphalt Paver	1	Diesel
Water Truck (tanker)	2	Diesel

Acces Road Quantities

3" Asphalt Concrete	94	Cubic Yards
4" Class II Aggregate Base (Road)	125	Cubic Yards
4" Class II Aggregate Base (3' wide shoulder)	37	Cubic Yards

Fencing and Disturbed Area Quantities

Total Acreage affected by onsite improvements	1.55	Acres
Total fencing to be installed	470	LF

B. Addition of AUX Boiler Foundation and Excavation

Required Equipment for AUX Boiler Installation

Backhoe (Excavator)	1	Diesel
Compactor / Rammer	2	Diesel
Concrete Pump	1	Diesel
Concrete Vibrator	2	Gas
Screeder	1	Gas
Dump Truck	1	Diesel
Flat Bed Truck	1	Diesel

AUX Boiler Installation Materials

Concrete (4,000 PSI)	27	Cubic Yards
Formwork (Bulk)	1	Lump Sum
Gravel Bedding 3/4" AB (#67)	18	Cubic Yards
Reinforcing Bars (Approx)	22	Tons

AUX Boiler Installation Time Frame

Total Time for AUX Boiler Installation	30	Days

Assumptions:

1. Existing roadways will be used to deliver backfill and fencing materials to site
2. Backfill quarry is sufficient (volume and quality)
3. Quarry to jobsite distance is 20 miles
4. Geotechnical report is available

Exclusions:

1. Laydown yard and on site facilities
2. Slope protection and drainage
3. SWPPP
4. Permit(s)

Time Summary

Civil Site Expansion Improvements	40	Days
AUX Boiler Foundation Excavation and Installation	30	Days

Fleet Average Emission Factors (Diesel)

2013

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	LBS/HP-HR						
Equipment	MaxHP	ROG	CO	NOX	SOX	PM	CO2	CH4	ROG	CO	NOX	SOX	PM	CO2	CH4
Aerial Lifts	15	0.0101	0.0528	0.0637	0.0001	0.0027	8.7	0.0009	0.0007	0.0035	0.0042	0.000009	0.0002	0.5768	0.000061
	25	0.0166	0.0503	0.0937	0.0001	0.0051	11.0	0.0015	0.0007	0.0020	0.0037	0.000006	0.0002	0.4384	0.000060
	50	0.0592	0.1757	0.1840	0.0003	0.0156	19.6	0.0053	0.0012	0.0035	0.0037	0.000005	0.0003	0.3923	0.000107
	120	0.0558	0.2425	0.3758	0.0004	0.0299	38.1	0.0050	0.0005	0.0020	0.0031	0.000004	0.0002	0.3173	0.000042
	500	0.1191	0.4671	1.5310	0.0021	0.0448	213	0.0107	0.0002	0.0009	0.0031	0.000004	0.0001	0.4257	0.000021
	750	0.2221	0.8443	2.8534	0.0039	0.0825	385	0.0200	0.0003	0.0011	0.0038	0.000005	0.0001	0.5130	0.000027
Aerial Lifts Total		0.0529	0.1925	0.3059	0.0004	0.0202	34.7	0.0048							
Air Compressors	15	0.0122	0.0484	0.0732	0.0001	0.0048	7.2	0.0011	0.0008	0.0032	0.0049	0.000007	0.0003	0.4815	0.000073
	25	0.0266	0.0744	0.1306	0.0002	0.0081	14.4	0.0024	0.0011	0.0030	0.0052	0.000007	0.0003	0.5778	0.000096
	50	0.0921	0.2546	0.2221	0.0003	0.0220	22.3	0.0083	0.0018	0.0051	0.0044	0.000006	0.0004	0.4454	0.000166
	120	0.0825	0.3251	0.4991	0.0006	0.0456	47.0	0.0074	0.0007	0.0027	0.0042	0.000005	0.0004	0.3913	0.000062
	175	0.1059	0.5054	0.8385	0.0010	0.0472	88.5	0.0096	0.0006	0.0029	0.0048	0.000006	0.0003	0.5056	0.000055
	250	0.1007	0.2955	1.1320	0.0015	0.0347	131	0.0091	0.0004	0.0012	0.0045	0.000006	0.0001	0.5249	0.000036
	500	0.1626	0.5399	1.7639	0.0023	0.0570	232	0.0147	0.0003	0.0011	0.0035	0.000005	0.0001	0.4635	0.000029
	750	0.2547	0.8344	2.8139	0.0036	0.0898	358	0.0230	0.0003	0.0011	0.0038	0.000005	0.0001	0.4775	0.000031
	1000	0.4190	1.4213	5.0841	0.0049	0.1474	486	0.0378	0.0004	0.0014	0.0051	0.000005	0.0001	0.4864	0.000038
Air Compressors Total		0.0913	0.3376	0.6065	0.0007	0.0434	63.6	0.0082							
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3	0.0011	0.0008	0.0042	0.0050	0.000011	0.0002	0.6897	0.000072
	25	0.0193	0.0658	0.1226	0.0002	0.0049	16.0	0.0017	0.0008	0.0026	0.0049	0.000008	0.0002	0.6395	0.000070
	50	0.0289	0.2282	0.2568	0.0004	0.0120	31.0	0.0026	0.0006	0.0046	0.0051	0.000008	0.0002	0.6207	0.000052
	120	0.0447	0.4698	0.4583	0.0009	0.0257	77.1	0.0040	0.0004	0.0039	0.0038	0.000008	0.0002	0.6427	0.000034
	175	0.0704	0.7538	0.6931	0.0016	0.0302	141	0.0063	0.0004	0.0043	0.0040	0.000009	0.0002	0.8062	0.000036
	250	0.0795	0.3429	0.7632	0.0021	0.0221	188	0.0072	0.0003	0.0014	0.0031	0.000008	0.0001	0.7524	0.000029
	500	0.1295	0.5517	1.1717	0.0031	0.0361	311	0.0117	0.0003	0.0011	0.0023	0.000006	0.0001	0.6226	0.000023
	750	0.2565	1.0899	2.3376	0.0062	0.0715	615	0.0231	0.0003	0.0015	0.0031	0.000008	0.0001	0.8201	0.000031
	1000	0.4163	1.6675	5.9553	0.0093	0.1544	928	0.0376	0.0004	0.0017	0.0060	0.000009	0.0002	0.9283	0.000038
Bore/Drill Rigs Total		0.0786	0.5044	0.8125	0.0017	0.0302	165	0.0071							
Cement and Mortar	15	0.0074	0.0386	0.0470	0.0001	0.0021	6.3	0.0007	0.0005	0.0026	0.0031	0.000007	0.0001	0.4213	0.000045
	25	0.0270	0.0813	0.1510	0.0002	0.0083	17.6	0.0024	0.0011	0.0033	0.0060	0.000009	0.0003	0.7022	0.000098
Cement and Mortar Mixers Total		0.0091	0.0421	0.0556	0.0001	0.0026	7.2	0.0008							
Concrete/Industrial	25	0.0199	0.0678	0.1257	0.0002	0.0049	16.5	0.0018	0.0008	0.0027	0.0050	0.000008	0.0002	0.6591	0.000072
	50	0.0955	0.2918	0.2858	0.0004	0.0247	30.2	0.0086	0.0019	0.0058	0.0057	0.000008	0.0005	0.6042	0.000172
	120	0.1065	0.4836	0.7154	0.0009	0.0589	74.1	0.0096	0.0009	0.0040	0.0060	0.000007	0.0005	0.6179	0.000080
	175	0.1569	0.8701	1.3612	0.0018	0.0706	160	0.0142	0.0009	0.0050	0.0078	0.000010	0.0004	0.9154	0.000081
Concrete/Industrial Saws Total		0.1002	0.4088	0.5572	0.0007	0.0452	58.5	0.0090							
Cranes	50	0.1015	0.2892	0.2394	0.0003	0.0239	23.2	0.0092	0.0020	0.0058	0.0048	0.000006	0.0005	0.4637	0.000183
	120	0.0919	0.3618	0.5508	0.0006	0.0493	50.1	0.0083	0.0008	0.0030	0.0046	0.000005	0.0004	0.4179	0.000069
	175	0.1031	0.4821	0.7769	0.0009	0.0445	80.3	0.0093	0.0006	0.0028	0.0044	0.000005	0.0003	0.4591	0.000053
	250	0.1040	0.2948	0.9948	0.0013	0.0351	112	0.0094	0.0004	0.0012	0.0040	0.000005	0.0001	0.4486	0.000038
	500	0.1551	0.5292	1.4230	0.0018	0.0518	180	0.0140	0.0003	0.0011	0.0028	0.000004	0.0001	0.3602	0.000028
	750	0.2625	0.8887	2.4614	0.0030	0.0885	303	0.0237	0.0003	0.0012	0.0033	0.000004	0.0001	0.4041	0.000032
	9999	0.9491	3.3249	10.3665	0.0098	0.3189	971	0.0856							
Cranes Total		0.1348	0.4737	1.1934	0.0014	0.0508	129	0.0122							

Crawler Tractors	50	0.1176	0.3246	0.2627	0.0003	0.0270	24.9	0.0106	0.0024	0.0065	0.0053	0.000006	0.0005	0.4976	0.000212
	120	0.1293	0.4858	0.7686	0.0008	0.0677	65.8	0.0117	0.0011	0.0040	0.0064	0.000006	0.0006	0.5484	0.000097
	175	0.1674	0.7448	1.2529	0.0014	0.0713	121	0.0151	0.0010	0.0043	0.0072	0.000008	0.0004	0.6925	0.000086
	250	0.1764	0.5000	1.5945	0.0019	0.0613	166	0.0159	0.0007	0.0020	0.0064	0.000007	0.0002	0.6645	0.000064
	500	0.2542	0.9504	2.2389	0.0025	0.0868	259	0.0229	0.0005	0.0019	0.0045	0.000005	0.0002	0.5185	0.000046
	750	0.4574	1.6983	4.1042	0.0047	0.1573	465	0.0413	0.0006	0.0023	0.0055	0.000006	0.0002	0.6196	0.000055
	1000	0.6901	2.6950	7.3731	0.0066	0.2361	658	0.0623	0.0007	0.0027	0.0074	0.000007	0.0002	0.6581	0.000062
Crawler Tractors Total		0.1584	0.5900	1.1593	0.0013	0.0697	114	0.0143							
Crushing/Proc. Equ	50	0.1741	0.5009	0.4359	0.0006	0.0422	44.0	0.0157	0.0035	0.0100	0.0087	0.000011	0.0008	0.8803	0.000314
	120	0.1402	0.5764	0.8552	0.0010	0.0779	83.1	0.0127	0.0012	0.0048	0.0071	0.000008	0.0006	0.6928	0.000105
	175	0.1942	0.9615	1.5237	0.0019	0.0864	167	0.0175	0.0011	0.0055	0.0087	0.000011	0.0005	0.9558	0.000100
	250	0.1848	0.5425	2.0202	0.0028	0.0620	245	0.0167	0.0007	0.0022	0.0081	0.000011	0.0002	0.9781	0.000067
	500	0.2608	0.8480	2.7097	0.0037	0.0884	374	0.0235	0.0005	0.0017	0.0054	0.000007	0.0002	0.7473	0.000047
	750	0.4147	1.3191	4.4498	0.0059	0.1418	589	0.0374	0.0006	0.0018	0.0059	0.000008	0.0002	0.7851	0.000050
	9999	1.1270	3.6752	13.3218	0.0131	0.3880	1,308	0.1017							
Crushing/Proc. Equipment Total		0.1733	0.6773	1.1752	0.0015	0.0748	132	0.0156							
Dumpers/Tenders	25	0.0097	0.0320	0.0601	0.0001	0.0029	7.6	0.0009	0.0004	0.0013	0.0024	0.000004	0.0001	0.3050	0.000035
Dumpers/Tenders Total		0.0097	0.0320	0.0601	0.0001	0.0029	7.6	0.0009							
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0047	16.4	0.0018	0.0008	0.0027	0.0050	0.000008	0.0002	0.6576	0.000072
	50	0.0816	0.2841	0.2458	0.0003	0.0212	25.0	0.0074	0.0016	0.0057	0.0049	0.000006	0.0004	0.5004	0.000147
	120	0.1086	0.5177	0.6791	0.0009	0.0586	73.6	0.0098	0.0009	0.0043	0.0057	0.000007	0.0005	0.6135	0.000082
	175	0.1208	0.6668	0.8932	0.0013	0.0512	112	0.0109	0.0007	0.0038	0.0051	0.000007	0.0003	0.6413	0.000062
	250	0.1242	0.3541	1.1360	0.0018	0.0372	159	0.0112	0.0005	0.0014	0.0045	0.000007	0.0001	0.6347	0.000045
	500	0.1735	0.5271	1.4763	0.0023	0.0516	234	0.0157	0.0003	0.0011	0.0030	0.000005	0.0001	0.4675	0.000031
	750	0.2895	0.8731	2.5290	0.0039	0.0871	387	0.0261	0.0004	0.0012	0.0034	0.000005	0.0001	0.5166	0.000035
Excavators Total		0.1220	0.5338	0.9071	0.0013	0.0481	120	0.0110							
Forklifts	50	0.0445	0.1623	0.1431	0.0002	0.0121	14.7	0.0040	0.0009	0.0032	0.0029	0.000004	0.0002	0.2934	0.000080
	120	0.0438	0.2176	0.2788	0.0004	0.0241	31.2	0.0040	0.0004	0.0018	0.0023	0.000003	0.0002	0.2602	0.000033
	175	0.0572	0.3307	0.4261	0.0006	0.0246	56.1	0.0052	0.0003	0.0019	0.0024	0.000004	0.0001	0.3203	0.000030
	250	0.0570	0.1614	0.5281	0.0009	0.0168	77.1	0.0051	0.0002	0.0006	0.0021	0.000003	0.0001	0.3085	0.000021
	500	0.0781	0.2208	0.6592	0.0011	0.0228	111	0.0070	0.0002	0.0004	0.0013	0.000002	0.0000	0.2220	0.000014
Forklifts Total		0.0541	0.2235	0.3950	0.0006	0.0204	54.4	0.0049							
Generator Sets	15	0.0149	0.0684	0.1016	0.0002	0.0058	10.2	0.0013	0.0010	0.0046	0.0068	0.000011	0.0004	0.6805	0.000090
	25	0.0266	0.0908	0.1594	0.0002	0.0091	17.6	0.0024	0.0011	0.0036	0.0064	0.000009	0.0004	0.7053	0.000096
	50	0.0872	0.2639	0.2847	0.0004	0.0234	30.6	0.0079	0.0017	0.0053	0.0057	0.000008	0.0005	0.6125	0.000157
	120	0.1106	0.4905	0.7587	0.0009	0.0590	77.9	0.0100	0.0009	0.0041	0.0063	0.000008	0.0005	0.6496	0.000083
	175	0.1347	0.7388	1.2314	0.0016	0.0592	142	0.0122	0.0008	0.0042	0.0070	0.000009	0.0003	0.8113	0.000069
	250	0.1277	0.4365	1.6763	0.0024	0.0464	213	0.0115	0.0005	0.0017	0.0067	0.000010	0.0002	0.8500	0.000046
	500	0.1818	0.7230	2.3955	0.0033	0.0690	337	0.0164	0.0004	0.0014	0.0048	0.000007	0.0001	0.6737	0.000033
	750	0.3035	1.1671	3.9863	0.0055	0.1134	544	0.0274	0.0004	0.0016	0.0053	0.000007	0.0002	0.7251	0.000037
Generator Sets Total		0.0767	0.3045	0.5430	0.0007	0.0324	61.0	0.0069							
Graders	50	0.1080	0.3263	0.2772	0.0004	0.0262	27.5	0.0097	0.0022	0.0065	0.0055	0.000007	0.0005	0.5508	0.000195
	120	0.1254	0.5310	0.7729	0.0009	0.0676	75.0	0.0113	0.0010	0.0044	0.0064	0.000007	0.0006	0.6247	0.000094
	175	0.1467	0.7345	1.1193	0.0014	0.0631	124	0.0132	0.0008	0.0042	0.0064	0.000008	0.0004	0.7081	0.000076
	250	0.1492	0.4331	1.4184	0.0019	0.0494	172	0.0135	0.0006	0.0017	0.0057	0.000008	0.0002	0.6885	0.000054
	500	0.1855	0.6289	1.6842	0.0023	0.0608	229	0.0167	0.0004	0.0013	0.0034	0.000005	0.0001	0.4590	0.000033
	750	0.3952	1.3289	3.6674	0.0049	0.1306	486	0.0357	0.0005	0.0018	0.0049	0.000007	0.0002	0.6477	0.000048
Graders Total		0.1446	0.6053	1.1663	0.0015	0.0593	133	0.0130							
Off-Highway Tractc	120	0.2113	0.7191	1.2368	0.0011	0.1078	93.7	0.0191	0.0018	0.0060	0.0103	0.000009	0.0009	0.7811	0.000159
	175	0.2045	0.8335	1.5337	0.0015	0.0871	130	0.0185	0.0012	0.0048	0.0088	0.000008	0.0005	0.7452	0.000105
	250	0.1641	0.4691	1.4453	0.0015	0.0601	130	0.0148	0.0007	0.0019	0.0058	0.000006	0.0002	0.5217	0.000059
	750	0.6538	2.8815	5.8130	0.0057	0.2353	568	0.0590	0.0009	0.0038	0.0078	0.000008	0.0003	0.7575	0.000079

	1000	0.9818	4.4978	10.0554	0.0082	0.3436	814	0.0886	0.0010	0.0045	0.0101	0.000008	0.0003	0.8143	0.000089
Off-Highway Tractors Total		0.2077	0.7649	1.7062	0.0017	0.0818	151	0.0187							
Off-Highway Trucks	175	0.1441	0.7580	1.0305	0.0014	0.0602	125	0.0130	0.0008	0.0043	0.0059	0.000008	0.0003	0.7148	0.000074
	250	0.1400	0.3837	1.2373	0.0019	0.0412	167	0.0126	0.0006	0.0015	0.0049	0.000007	0.0002	0.6662	0.000051
	500	0.2170	0.6362	1.7865	0.0027	0.0634	272	0.0196	0.0004	0.0013	0.0036	0.000005	0.0001	0.5447	0.000039
	750	0.3542	1.0311	2.9938	0.0044	0.1046	442	0.0320	0.0005	0.0014	0.0040	0.000006	0.0001	0.5890	0.000043
	1000	0.5484	1.6691	5.9808	0.0063	0.1796	625	0.0495	0.0005	0.0017	0.0060	0.000006	0.0002	0.6247	0.000049
Off-Highway Trucks Total		0.2141	0.6361	1.8543	0.0027	0.0644	260	0.0193							
Other Construction	15	0.0118	0.0617	0.0737	0.0002	0.0029	10.1	0.0011	0.0008	0.0041	0.0049	0.000010	0.0002	0.6738	0.000071
	25	0.0160	0.0544	0.1013	0.0002	0.0041	13.2	0.0014	0.0006	0.0022	0.0041	0.000007	0.0002	0.5287	0.000058
	50	0.0753	0.2653	0.2585	0.0004	0.0205	28.0	0.0068	0.0015	0.0053	0.0052	0.000007	0.0004	0.5598	0.000136
	120	0.1006	0.5277	0.7025	0.0009	0.0567	80.9	0.0091	0.0008	0.0044	0.0059	0.000008	0.0005	0.6738	0.000076
	175	0.0935	0.5873	0.8011	0.0012	0.0420	107	0.0084	0.0005	0.0034	0.0046	0.000007	0.0002	0.6087	0.000048
	500	0.1452	0.5234	1.5187	0.0025	0.0491	254	0.0131	0.0003	0.0010	0.0030	0.000005	0.0001	0.5085	0.000026
Other Construction Equipment To		0.0872	0.3765	0.7938	0.0013	0.0330	123	0.0079							
Other General Indu	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4	0.0006	0.0004	0.0026	0.0031	0.000007	0.0001	0.4264	0.000040
	25	0.0185	0.0632	0.1170	0.0002	0.0044	15.3	0.0017	0.0007	0.0025	0.0047	0.000008	0.0002	0.6140	0.000067
	50	0.0980	0.2738	0.2243	0.0003	0.0232	21.7	0.0088	0.0020	0.0055	0.0045	0.000006	0.0005	0.4349	0.000177
	120	0.1177	0.4487	0.6789	0.0007	0.0644	62.0	0.0106	0.0010	0.0037	0.0057	0.000006	0.0005	0.5170	0.000089
	175	0.1261	0.5728	0.9333	0.0011	0.0549	95.9	0.0114	0.0007	0.0033	0.0053	0.000006	0.0003	0.5482	0.000065
	250	0.1174	0.3177	1.2013	0.0015	0.0380	136	0.0106	0.0005	0.0013	0.0048	0.000006	0.0002	0.5423	0.000042
	500	0.2135	0.6384	2.0642	0.0026	0.0693	265	0.0193	0.0004	0.0013	0.0041	0.000005	0.0001	0.5308	0.000039
	750	0.3546	1.0522	3.5146	0.0044	0.1165	437	0.0320	0.0005	0.0014	0.0047	0.000006	0.0002	0.5833	0.000043
	1000	0.5246	1.6793	6.0067	0.0056	0.1805	560	0.0473	0.0005	0.0017	0.0060	0.000006	0.0002	0.5596	0.000047
Other General Industrial Equipme		0.1542	0.5159	1.3484	0.0016	0.0580	152	0.0139							
Other Material Han	50	0.1361	0.3789	0.3119	0.0004	0.0323	30.3	0.0123	0.0027	0.0076	0.0062	0.000008	0.0006	0.6067	0.000246
	120	0.1144	0.4370	0.6628	0.0007	0.0628	60.7	0.0103	0.0010	0.0036	0.0055	0.000006	0.0005	0.5056	0.000086
	175	0.1591	0.7257	1.1860	0.0014	0.0696	122	0.0144	0.0009	0.0041	0.0068	0.000008	0.0004	0.6976	0.000082
	250	0.1241	0.3385	1.2829	0.0016	0.0405	145	0.0112	0.0005	0.0014	0.0051	0.000007	0.0002	0.5801	0.000045
	500	0.1521	0.4596	1.4883	0.0019	0.0498	192	0.0137	0.0003	0.0009	0.0030	0.000004	0.0001	0.3833	0.000027
Other Material Handling Equipme		0.1473	0.4951	1.3132	0.0015	0.0562	141	0.0133							
Pavers	25	0.0247	0.0799	0.1500	0.0002	0.0075	18.7	0.0022	0.0010	0.0032	0.0060	0.000009	0.0003	0.7464	0.000089
	50	0.1366	0.3592	0.2948	0.0004	0.0308	28.0	0.0123	0.0027	0.0072	0.0059	0.000007	0.0006	0.5598	0.000246
	120	0.1387	0.5057	0.8357	0.0008	0.0729	69.2	0.0125	0.0012	0.0042	0.0070	0.000007	0.0006	0.5766	0.000104
	175	0.1777	0.7784	1.3769	0.0014	0.0769	128	0.0160	0.0010	0.0044	0.0079	0.000008	0.0004	0.7331	0.000092
	250	0.2072	0.6081	1.9469	0.0022	0.0756	194	0.0187	0.0008	0.0024	0.0078	0.000009	0.0003	0.7775	0.000075
	500	0.2275	0.9254	2.1080	0.0023	0.0818	233	0.0205	0.0005	0.0019	0.0042	0.000005	0.0002	0.4665	0.000041
Pavers Total		0.1511	0.5357	0.8542	0.0009	0.0603	77.9	0.0136							
Paving Equipment	25	0.0153	0.0520	0.0968	0.0002	0.0039	12.6	0.0014	0.0006	0.0021	0.0039	0.000006	0.0002	0.5051	0.000055
	50	0.1166	0.3049	0.2514	0.0003	0.0263	23.9	0.0105	0.0023	0.0061	0.0050	0.000006	0.0005	0.4785	0.000210
	120	0.1087	0.3958	0.6561	0.0006	0.0574	54.5	0.0098	0.0009	0.0033	0.0055	0.000005	0.0005	0.4542	0.000082
	175	0.1387	0.6079	1.0816	0.0011	0.0602	101	0.0125	0.0008	0.0035	0.0062	0.000006	0.0003	0.5773	0.000072
	250	0.1277	0.3763	1.2206	0.0014	0.0467	122	0.0115	0.0005	0.0015	0.0049	0.000006	0.0002	0.4892	0.000046
Paving Equipment Total		0.1142	0.4316	0.7709	0.0008	0.0536	68.9	0.0103							
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0012	4.3	0.0005	0.0003	0.0018	0.0021	0.000004	0.0001	0.2876	0.000030
Plate Compactors Total		0.0050	0.0263	0.0314	0.0001	0.0012	4.3	0.0005							
Pressure Washers	15	0.0071	0.0328	0.0487	0.0001	0.0028	4.9	0.0006	0.0005	0.0022	0.0032	0.000005	0.0002	0.3260	0.000043
	25	0.0108	0.0368	0.0646	0.0001	0.0037	7.1	0.0010	0.0004	0.0015	0.0026	0.000004	0.0001	0.2859	0.000039
	50	0.0315	0.1037	0.1284	0.0002	0.0094	14.3	0.0028	0.0006	0.0021	0.0026	0.000004	0.0002	0.2859	0.000057
	120	0.0302	0.1443	0.2235	0.0003	0.0157	24.1	0.0027	0.0003	0.0012	0.0019	0.000002	0.0001	0.2006	0.000023

Pressure Washers Total		0.0159	0.0619	0.0878	0.0001	0.0058	9.4	0.0014							
Pumps	15	0.0125	0.0497	0.0752	0.0001	0.0049	7.4	0.0011	0.0008	0.0033	0.0050	0.000008	0.0003	0.4949	0.000075
	25	0.0359	0.1004	0.1761	0.0002	0.0109	19.5	0.0032	0.0014	0.0040	0.0070	0.000010	0.0004	0.7795	0.000129
	50	0.1052	0.3116	0.3228	0.0004	0.0275	34.3	0.0095	0.0021	0.0062	0.0065	0.000009	0.0005	0.6867	0.000190
	120	0.1149	0.4984	0.7706	0.0009	0.0617	77.9	0.0104	0.0010	0.0042	0.0064	0.000008	0.0005	0.6496	0.000086
	175	0.1385	0.7405	1.2344	0.0016	0.0611	140	0.0125	0.0008	0.0042	0.0071	0.000009	0.0003	0.8007	0.000071
	250	0.1266	0.4210	1.6140	0.0023	0.0457	201	0.0114	0.0005	0.0017	0.0065	0.000009	0.0002	0.8055	0.000046
	500	0.1952	0.7595	2.4849	0.0034	0.0734	345	0.0176	0.0004	0.0015	0.0050	0.000007	0.0001	0.6904	0.000035
	750	0.3326	1.2556	4.2353	0.0057	0.1235	571	0.0300	0.0004	0.0017	0.0056	0.000008	0.0002	0.7609	0.000040
Pumps Total		0.0748	0.2926	0.4705	0.0006	0.0323	49.6	0.0067							
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3	0.0007	0.0005	0.0026	0.0031	0.000007	0.0001	0.4213	0.000044
	25	0.0161	0.0549	0.1023	0.0002	0.0041	13.3	0.0015	0.0006	0.0022	0.0041	0.000007	0.0002	0.5337	0.000058
	50	0.1025	0.2911	0.2583	0.0003	0.0245	26.0	0.0092	0.0020	0.0058	0.0052	0.000007	0.0005	0.5197	0.000185
	120	0.0986	0.4063	0.6253	0.0007	0.0534	59.0	0.0089	0.0008	0.0034	0.0052	0.000006	0.0004	0.4916	0.000074
	175	0.1247	0.6199	1.0114	0.0012	0.0550	108	0.0113	0.0007	0.0035	0.0058	0.000007	0.0003	0.6180	0.000064
	250	0.1262	0.3887	1.3124	0.0017	0.0451	153	0.0114	0.0005	0.0016	0.0052	0.000007	0.0002	0.6124	0.000046
	500	0.1654	0.6313	1.6820	0.0022	0.0593	219	0.0149	0.0003	0.0013	0.0034	0.000004	0.0001	0.4382	0.000030
Rollers Total		0.0973	0.4060	0.6546	0.0008	0.0453	67.1	0.0088							
Rough Terrain Fork	50	0.1181	0.3778	0.3316	0.0004	0.0300	33.9	0.0107	0.0024	0.0076	0.0066	0.000009	0.0006	0.6772	0.000213
	120	0.0955	0.4327	0.5995	0.0007	0.0529	62.4	0.0086	0.0008	0.0036	0.0050	0.000006	0.0004	0.5204	0.000072
	175	0.1352	0.7256	1.0448	0.0014	0.0592	125	0.0122	0.0008	0.0041	0.0060	0.000008	0.0003	0.7137	0.000070
	250	0.1294	0.3798	1.2955	0.0019	0.0416	171	0.0117	0.0005	0.0015	0.0052	0.000008	0.0002	0.6832	0.000047
	500	0.1824	0.5717	1.7096	0.0025	0.0584	257	0.0165	0.0004	0.0011	0.0034	0.000005	0.0001	0.5131	0.000033
Rough Terrain Forklifts Total		0.1009	0.4642	0.6526	0.0008	0.0532	70.3	0.0091							
Rubber Tired Doze	175	0.2119	0.8457	1.5561	0.0015	0.0893	129	0.0191	0.0012	0.0048	0.0089	0.000008	0.0005	0.7399	0.000109
	250	0.2435	0.6833	2.0817	0.0021	0.0881	183	0.0220	0.0010	0.0027	0.0083	0.000008	0.0004	0.7339	0.000088
	500	0.3211	1.4228	2.7305	0.0026	0.1133	265	0.0290	0.0006	0.0028	0.0055	0.000005	0.0002	0.5297	0.000058
	750	0.4843	2.1329	4.1797	0.0040	0.1716	399	0.0437	0.0006	0.0028	0.0056	0.000005	0.0002	0.5317	0.000058
	1000	0.7496	3.4322	7.4509	0.0060	0.2591	592	0.0676	0.0007	0.0034	0.0075	0.000006	0.0003	0.5919	0.000068
Rubber Tired Dozers Total		0.2986	1.1749	2.5452	0.0025	0.1064	239	0.0269							
Rubber Tired Load	25	0.0204	0.0697	0.1292	0.0002	0.0050	16.9	0.0018	0.0008	0.0028	0.0052	0.000009	0.0002	0.6772	0.000074
	50	0.1200	0.3641	0.3118	0.0004	0.0292	31.1	0.0108	0.0024	0.0073	0.0062	0.000008	0.0006	0.6230	0.000216
	120	0.0971	0.4152	0.6015	0.0007	0.0525	58.9	0.0088	0.0008	0.0035	0.0050	0.000006	0.0004	0.4909	0.000073
	175	0.1238	0.6274	0.9501	0.0012	0.0535	106	0.0112	0.0007	0.0036	0.0054	0.000007	0.0003	0.6075	0.000064
	250	0.1259	0.3685	1.2125	0.0017	0.0417	149	0.0114	0.0005	0.0015	0.0048	0.000007	0.0002	0.5959	0.000045
	500	0.1867	0.6397	1.7158	0.0023	0.0613	237	0.0168	0.0004	0.0013	0.0034	0.000005	0.0001	0.4740	0.000034
	750	0.3850	1.3084	3.6184	0.0049	0.1276	486	0.0347	0.0005	0.0017	0.0048	0.000007	0.0002	0.6474	0.000046
	1000	0.5190	1.8389	5.9660	0.0060	0.1795	594	0.0468	0.0005	0.0018	0.0060	0.000006	0.0002	0.5939	0.000047
Rubber Tired Loaders Total		0.1195	0.4763	0.9346	0.0012	0.0508	109	0.0108							
Scrapers	120	0.1877	0.6943	1.1141	0.0011	0.0983	93.9	0.0169	0.0016	0.0058	0.0093	0.000009	0.0008	0.7825	0.000141
	175	0.2070	0.9107	1.5564	0.0017	0.0884	148	0.0187	0.0012	0.0052	0.0089	0.000010	0.0005	0.8461	0.000107
	250	0.2252	0.6408	2.0481	0.0024	0.0791	209	0.0203	0.0009	0.0026	0.0082	0.000009	0.0003	0.8379	0.000081
	500	0.3186	1.2113	2.8288	0.0032	0.1099	321	0.0287	0.0006	0.0024	0.0057	0.000006	0.0002	0.6429	0.000057
	750	0.5525	2.0861	4.9949	0.0056	0.1918	555	0.0499	0.0007	0.0028	0.0067	0.000007	0.0003	0.7404	0.000066
Scrapers Total		0.2783	1.0395	2.4118	0.0027	0.1005	262	0.0251							
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0018	6.2	0.0006	0.0005	0.0025	0.0030	0.000006	0.0001	0.4113	0.000043
	50	0.1151	0.3456	0.3415	0.0005	0.0296	36.2	0.0104	0.0023	0.0069	0.0068	0.000009	0.0006	0.7238	0.000208
	120	0.1176	0.5214	0.7807	0.0009	0.0644	80.2	0.0106	0.0010	0.0043	0.0065	0.000008	0.0005	0.6684	0.000088
	175	0.1535	0.8341	1.3333	0.0017	0.0685	155	0.0139	0.0009	0.0048	0.0076	0.000010	0.0004	0.8831	0.000079
	250	0.1632	0.5350	1.9963	0.0029	0.0580	255	0.0147	0.0007	0.0021	0.0080	0.000011	0.0002	1.0212	0.000059
Signal Boards Total		0.0192	0.0934	0.1399	0.0002	0.0077	16.7	0.0017							

Skid Steer Loaders	25	0.0202	0.0620	0.1166	0.0002	0.0063	13.8	0.0018	0.0008	0.0025	0.0047	0.000007	0.0003	0.5518	0.000073
	50	0.0517	0.2263	0.2279	0.0003	0.0157	25.5	0.0047	0.0010	0.0045	0.0046	0.000007	0.0003	0.5104	0.000093
	120	0.0429	0.2748	0.3267	0.0005	0.0245	42.8	0.0039	0.0004	0.0023	0.0027	0.000004	0.0002	0.3563	0.000032
Skid Steer Loaders Total		0.0468	0.2309	0.2522	0.0004	0.0179	30.3	0.0042							
Surfacing Equipme	50	0.0477	0.1403	0.1359	0.0002	0.0119	14.1	0.0043	0.0010	0.0028	0.0027	0.000004	0.0002	0.2822	0.000086
	120	0.0970	0.4215	0.6523	0.0007	0.0517	63.8	0.0088	0.0008	0.0035	0.0054	0.000006	0.0004	0.5314	0.000073
	175	0.0894	0.4730	0.7742	0.0010	0.0392	85.8	0.0081	0.0005	0.0027	0.0044	0.000006	0.0002	0.4901	0.000046
	250	0.1025	0.3374	1.1177	0.0015	0.0376	135	0.0092	0.0004	0.0013	0.0045	0.000006	0.0002	0.5395	0.000037
	500	0.1532	0.6418	1.6597	0.0022	0.0567	221	0.0138	0.0003	0.0013	0.0033	0.000004	0.0001	0.4424	0.000028
	750	0.2443	1.0046	2.6697	0.0035	0.0900	347	0.0220	0.0003	0.0013	0.0036	0.000005	0.0001	0.4627	0.000029
Surfacing Equipment Total		0.1277	0.5182	1.2760	0.0017	0.0468	166	0.0115							
Sweepers/Scrubbe	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9	0.0011	0.0008	0.0049	0.0058	0.000012	0.0002	0.7959	0.000074
	25	0.0237	0.0808	0.1496	0.0002	0.0058	19.6	0.0021	0.0009	0.0032	0.0060	0.000010	0.0002	0.7845	0.000085
	50	0.1048	0.3425	0.3055	0.0004	0.0271	31.6	0.0095	0.0021	0.0068	0.0061	0.000008	0.0005	0.6310	0.000189
	120	0.1107	0.5147	0.6989	0.0009	0.0622	75.0	0.0100	0.0009	0.0043	0.0058	0.000007	0.0005	0.6253	0.000083
	175	0.1439	0.7997	1.1204	0.0016	0.0637	139	0.0130	0.0008	0.0046	0.0064	0.000009	0.0004	0.7943	0.000074
	250	0.1146	0.3382	1.1784	0.0018	0.0362	162	0.0103	0.0005	0.0014	0.0047	0.000007	0.0001	0.6481	0.000041
Sweepers/Scrubbers Total		0.1148	0.5145	0.6862	0.0009	0.0510	78.5	0.0104							
Tractors/Loaders/B	25	0.0195	0.0657	0.1237	0.0002	0.0056	15.9	0.0018	0.0008	0.0026	0.0049	0.000008	0.0002	0.6345	0.000070
	50	0.0893	0.3199	0.2893	0.0004	0.0238	30.3	0.0081	0.0018	0.0064	0.0058	0.000008	0.0005	0.6069	0.000161
	120	0.0694	0.3529	0.4565	0.0006	0.0383	51.7	0.0063	0.0006	0.0029	0.0038	0.000005	0.0003	0.4311	0.000052
	175	0.0988	0.5861	0.7696	0.0011	0.0428	101	0.0089	0.0006	0.0033	0.0044	0.000007	0.0002	0.5794	0.000051
	250	0.1204	0.3666	1.1658	0.0019	0.0370	172	0.0109	0.0005	0.0015	0.0047	0.000008	0.0001	0.6869	0.000043
	500	0.2290	0.7443	2.0659	0.0039	0.0701	345	0.0207	0.0005	0.0015	0.0041	0.000008	0.0001	0.6897	0.000041
	750	0.3462	1.1159	3.2041	0.0058	0.1072	517	0.0312	0.0005	0.0015	0.0043	0.000008	0.0001	0.6897	0.000042
Tractors/Loaders/Backhoes Total		0.0792	0.3782	0.5392	0.0008	0.0387	66.8	0.0071							
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5	0.0009	0.0007	0.0034	0.0041	0.000009	0.0002	0.5643	0.000059
	25	0.0397	0.1355	0.2511	0.0004	0.0097	32.9	0.0036	0.0016	0.0054	0.0100	0.000017	0.0004	1.3167	0.000143
	50	0.1566	0.4082	0.3432	0.0004	0.0353	32.9	0.0141	0.0031	0.0082	0.0069	0.000009	0.0007	0.6584	0.000283
	120	0.1281	0.4684	0.7862	0.0008	0.0669	64.9	0.0116	0.0011	0.0039	0.0066	0.000006	0.0006	0.5408	0.000096
	175	0.1955	0.8632	1.5520	0.0016	0.0849	144	0.0176	0.0011	0.0049	0.0089	0.000009	0.0005	0.8223	0.000101
	250	0.2354	0.7089	2.2485	0.0025	0.0880	223	0.0212	0.0009	0.0028	0.0090	0.000010	0.0004	0.8916	0.000085
	500	0.2985	1.3011	2.8470	0.0031	0.1105	311	0.0269	0.0006	0.0026	0.0057	0.000006	0.0002	0.6226	0.000054
	750	0.5663	2.4440	5.4715	0.0059	0.2099	587	0.0511	0.0008	0.0033	0.0073	0.000008	0.0003	0.7825	0.000068
Trenchers Total		0.1427	0.4675	0.6684	0.0007	0.0549	58.7	0.0129							
Welders	15	0.0104	0.0416	0.0629	0.0001	0.0041	6.2	0.0009	0.0007	0.0028	0.0042	0.000006	0.0003	0.4138	0.000063
	25	0.0208	0.0581	0.1020	0.0001	0.0063	11.3	0.0019	0.0008	0.0023	0.0041	0.000006	0.0003	0.4514	0.000075
	50	0.0979	0.2753	0.2535	0.0003	0.0240	26.0	0.0088	0.0020	0.0055	0.0051	0.000007	0.0005	0.5192	0.000177
	120	0.0654	0.2659	0.4099	0.0005	0.0358	39.5	0.0059	0.0005	0.0022	0.0034	0.000004	0.0003	0.3292	0.000049
	175	0.1101	0.5455	0.9083	0.0011	0.0490	98.2	0.0099	0.0006	0.0031	0.0052	0.000006	0.0003	0.5611	0.000057
	250	0.0855	0.2618	1.0026	0.0013	0.0301	119	0.0077	0.0003	0.0010	0.0040	0.000005	0.0001	0.4763	0.000031
	500	0.1092	0.3838	1.2526	0.0016	0.0394	168	0.0098	0.0002	0.0008	0.0025	0.000003	0.0001	0.3352	0.000020
Welders Total		0.0646	0.2096	0.2564	0.0003	0.0225	25.6	0.0058							

	ROG	CO	NOX	SOX	PM	CO2	CH4
Average Emissions Factors, lb/hr: All Equip, HP Categories	0.1105 (lb/hr)	0.4296 (lb/hr)	0.8339 (lb/hr)	0.0010 (lb/hr)	0.0441 (lb/hr)	94.4934 (lb/hr)	0.0100 (lb/hr)

Highest (Most Conservative) EMFAC2007 (version 2.3) Emission Factors for On-Road Passenger Vehicles & Delivery Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2007 (version 2.3) Burden Model, taking the weighted average of vehicle types and simplifying into two categories: **Passenger Vehicles & Delivery Trucks.**

These emission factors can be used to calculate on-road mobile source emissions for the vehicle categories listed in the tables below, by use of the following equation:

Emissions (pounds per day) = N x TL x EF

where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

This methodology replaces the old EMFAC emission factors in Tables A-9-5-J-1 through A-9-5-L in Appendix A9 of the current SCAQMD CEQA Handbook. All the emission factors account for the emissions from start, running and idling exhaust. In addition, the ROG emission factors include diurnal, hot soak, running and resting emissions, and the PM10 & PM2.5 emission factors include tire and brake wear.

Scenario Year: **2007**
All model years in the range 1965 to 2007

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.01155158	CO	0.02407553
NOx	0.00121328	NOx	0.02508445
ROG	0.00118234	ROG	0.00323145
SOx	0.00001078	SOx	0.00002626
PM10	0.00008447	PM10	0.00091020
PM2.5	0.00005243	PM2.5	0.00078884
CO2	1.10672236	CO2	2.72245619
CH4	0.00010306	CH4	0.00016030

Scenario Year: **2008**
All model years in the range 1965 to 2008

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.01054844	CO	0.02194915
NOx	0.00110288	NOx	0.02371258
ROG	0.00107919	ROG	0.00299270
SOx	0.00001075	SOx	0.00002565
PM10	0.00008505	PM10	0.00085607
PM2.5	0.00005293	PM2.5	0.00073933
CO2	1.09953226	CO2	2.71943400
CH4	0.00009465	CH4	0.00014769

Scenario Year: **2009**
All model years in the range 1965 to 2009

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00968562	CO	0.02016075
NOx	0.00100518	NOx	0.02236636
ROG	0.00099245	ROG	0.00278899
SOx	0.00001066	SOx	0.00002679
PM10	0.00008601	PM10	0.00080550
PM2.5	0.00005384	PM2.5	0.00069228
CO2	1.09755398	CO2	2.72330496
CH4	0.00008767	CH4	0.00013655

Scenario Year: **2010**
All model years in the range 1966 to 2010

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00826276	CO	0.01843765
NOx	0.00091814	NOx	0.02062460
ROG	0.00091399	ROG	0.00258958
SOx	0.00001077	SOx	0.00002701
PM10	0.00008698	PM10	0.00075121
PM2.5	0.00005478	PM2.5	0.00064233
CO2	1.09568235	CO2	2.73222199
CH4	0.00008146	CH4	0.00012576

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Passenger Vehicles & Delivery Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)

Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

Scenario Year: **2011**

All model years in the range 1967 to 2011

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00826276	CO	0.01693242
NOx	0.00084460	NOx	0.01893366
ROG	0.00085233	ROG	0.00241868
SOx	0.00001077	SOx	0.00002728
PM10	0.00008879	PM10	0.00070097
PM2.5	0.00005653	PM2.5	0.00059682
CO2	1.10235154	CO2	2.75180822
CH4	0.00007678	CH4	0.00011655

Scenario Year: **2012**

All model years in the range 1968 to 2012

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00765475	CO	0.01545741
NOx	0.00077583	NOx	0.01732423
ROG	0.00079628	ROG	0.00223776
SOx	0.00001073	SOx	0.00002667
PM10	0.00008979	PM10	0.00064975
PM2.5	0.00005750	PM2.5	0.00054954
CO2	1.10152540	CO2	2.76628414
CH4	0.00007169	CH4	0.00010668

Scenario Year: **2013**

All model years in the range 1969 to 2013

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00709228	CO	0.01407778
NOx	0.00071158	NOx	0.01577311
ROG	0.00074567	ROG	0.00206295
SOx	0.00001072	SOx	0.00002682
PM10	0.00009067	PM10	0.00059956
PM2.5	0.00005834	PM2.5	0.00050174
CO2	1.10087435	CO2	2.78163459
CH4	0.00006707	CH4	0.00009703

Scenario Year: **2014**

All model years in the range 1970 to 2014

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00660353	CO	0.01284321
NOx	0.00065484	NOx	0.01425162
ROG	0.00070227	ROG	0.00189649
SOx	0.00001069	SOx	0.00002754
PM10	0.00009185	PM10	0.00054929
PM2.5	0.00005939	PM2.5	0.00045519
CO2	1.10257205	CO2	2.79845465
CH4	0.00006312	CH4	0.00008798

Scenario Year: **2015**

All model years in the range 1971 to 2015

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00614108	CO	0.01169445
NOx	0.00060188	NOx	0.01285026
ROG	0.00066355	ROG	0.00173890
SOx	0.00001070	SOx	0.00002741
PM10	0.00009259	PM10	0.00050307
PM2.5	0.00006015	PM2.5	0.00041268
CO2	1.10192837	CO2	2.81247685
CH4	0.00005923	CH4	0.00008076

Scenario Year: **2016**

All model years in the range 1972 to 2016

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00575800	CO	0.01080542
NOx	0.00055658	NOx	0.01172881
ROG	0.00063254	ROG	0.00161521
SOx	0.00001071	SOx	0.00002767
PM10	0.00009392	PM10	0.00046606
PM2.5	0.00006131	PM2.5	0.00037868
CO2	1.10677664	CO2	2.83134285
CH4	0.00005623	CH4	0.00007355

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Passenger Vehicles & Delivery Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

Scenario Year: **2017**
All model years in the range 1973 to 2017

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00537891	CO	0.00998101
NOx	0.00051297	NOx	0.01070034
ROG	0.00060109	ROG	0.00150242
SOx	0.00001079	SOx	0.00002723
PM10	0.00009446	PM10	0.00043131
PM2.5	0.00006192	PM2.5	0.00034605
CO2	1.10627489	CO2	2.84005015
CH4	0.00005300	CH4	0.00006663

Scenario Year: **2018**
All model years in the range 1974 to 2018

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00502881	CO	0.00923234
NOx	0.00047300	NOx	0.00979416
ROG	0.00057178	ROG	0.00139856
SOx	0.00001071	SOx	0.00002749
PM10	0.00009494	PM10	0.00040110
PM2.5	0.00006234	PM2.5	0.00031792
CO2	1.10562643	CO2	2.84646835
CH4	0.00005003	CH4	0.00006203

Scenario Year: **2019**
All model years in the range 1975 to 2019

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00471820	CO	0.00857192
NOx	0.00043716	NOx	0.00900205
ROG	0.00054654	ROG	0.00130563
SOx	0.00001072	SOx	0.00002706
PM10	0.00009523	PM10	0.00037393
PM2.5	0.00006259	PM2.5	0.00029276
CO2	1.10496100	CO2	2.85060182
CH4	0.00004743	CH4	0.00005619

Scenario Year: **2020**
All model years in the range 1976 to 2020

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00444247	CO	0.00799617
NOx	0.00040506	NOx	0.00831802
ROG	0.00052463	ROG	0.00122382
SOx	0.00001073	SOx	0.00002733
PM10	0.00009550	PM10	0.00035054
PM2.5	0.00006279	PM2.5	0.00027128
CO2	1.10456157	CO2	2.85148109
CH4	0.00004495	CH4	0.00005330

Scenario Year: **2021**
All model years in the range 1977 to 2021

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00421218	CO	0.00748303
NOx	0.00037757	NOx	0.00773500
ROG	0.00050573	ROG	0.00115568
SOx	0.00001073	SOx	0.00002755
PM10	0.00009640	PM10	0.00033125
PM2.5	0.00006364	PM2.5	0.00025331
CO2	1.11009559	CO2	2.86434187
CH4	0.00004322	CH4	0.00004905

Scenario Year: **2022**
All model years in the range 1978 to 2022

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00397866	CO	0.00699290
NOx	0.00035150	NOx	0.00722470
ROG	0.00048658	ROG	0.00108569
SOx	0.00001072	SOx	0.00002774
PM10	0.00009661	PM10	0.00031501
PM2.5	0.00006389	PM2.5	0.00023906
CO2	1.11019931	CO2	2.87006769
CH4	0.00004121	CH4	0.00004557

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Passenger Vehicles & Delivery Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)

Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

Scenario Year: **2023**

All model years in the range 1979 to 2023

Passenger Vehicles (pounds/mile)	
CO	0.00377527
NOx	0.00032851
ROG	0.00046900
SOx	0.00001070
PM10	0.00009676
PM2.5	0.00006405
CO2	1.11023373
CH4	0.00003951

Delivery Trucks (pounds/mile)	
CO	0.00658123
NOx	0.00679147
ROG	0.00102852
SOx	0.00002790
PM10	0.00030109
PM2.5	0.00022582
CO2	2.87466338
CH4	0.00004218

Scenario Year: **2024**

All model years in the range 1980 to 2024

Passenger Vehicles (pounds/mile)	
CO	0.00358611
NOx	0.00030721
ROG	0.00045136
SOx	0.00001080
PM10	0.00009676
PM2.5	0.00006410
CO2	1.11061572
CH4	0.00003781

Delivery Trucks (pounds/mile)	
CO	0.00625076
NOx	0.00647083
ROG	0.00096578
SOx	0.00002807
PM10	0.00029407
PM2.5	0.00021880
CO2	2.88010717
CH4	0.00004019

Scenario Year: **2025**

All model years in the range 1981 to 2025

Passenger Vehicles (pounds/mile)	
CO	0.00342738
NOx	0.00028846
ROG	0.00043545
SOx	0.00001070
PM10	0.00009679
PM2.5	0.00006418
CO2	1.11078571
CH4	0.00003641

Delivery Trucks (pounds/mile)	
CO	0.00595363
NOx	0.00615945
ROG	0.00092178
SOx	0.00002761
PM10	0.00028425
PM2.5	0.00020958
CO2	2.88143570
CH4	0.00003765

Scenario Year: **2026**

All model years in the range 1982 to 2026

Passenger Vehicles (pounds/mile)	
CO	0.00328779
NOx	0.00027141
ROG	0.00042052
SOx	0.00001076
PM10	0.00009687
PM2.5	0.00006415
CO2	1.11105829
CH4	0.00003518

Delivery Trucks (pounds/mile)	
CO	0.00569435
NOx	0.00589869
ROG	0.00088403
SOx	0.00002716
PM10	0.00027657
PM2.5	0.00020187
CO2	2.88298299
CH4	0.00003581

Appendix 3.1E
Best Available Control Technology (BACT) Analysis

APPENDIX 3.1E

Evaluation of Best Available Control Technology

Section 1 - BACT Analysis Methods and Assumptions

Background

In general, California New Source Review Regulations require a control technology that has been achieved in practice for a class or category of source be required as BACT/LAER for sources in that class or category without considering case-by-case economic impact. (Note: In some cases, economic considerations may be taken into account in establishing a class or category of source.) Additionally, many air districts require other more effective technologies that have not been achieved in practice for a class or category of source if the control is shown to be technologically and economically feasible.

Unlike federal BACT/LAER that only apply to major sources, California requirements apply to a great variety of small and large sources. Therefore, clear identification of the sources that are included in a given class or category for which a BACT/LAER determination is being or has been made is critical to reasonable implementation of BACT/LAER requirements in California. Additionally, it is vitally important to ascertain the availability, reliability, and effectiveness of a control technology before deeming it as having been achieved in practice for a class or category of sources.

Top-Down BACT Assessment

EPA recommends using a "top-down" approach for determining BACT and LAER. This approach essentially ranks potential control technologies in order of effectiveness and ensures that the best technically and economically feasible option is chosen. As described in EPA's *New Source Review Workshop Manual*, draft, October 1990, the general methodology of this approach is as follows:

1. Identify potential control technologies, including combinations of control technologies, for each pollutant subject to NSR-PSD review. The control technologies identified should include; inherently lower-emitting processes/practices, add-on controls, or a combination of the two.
2. Evaluate each control technology for technical feasibility; eliminate those determined to be technically infeasible.
3. Rank the remaining technically feasible control technologies in order of control effectiveness.
4. Assume the highest-ranking technically feasible control represents BACT/LAER, unless it can be shown to result in adverse environmental, energy, or economic impacts. LAER determinations do not typically include an economic impact evaluation. (Economic impacts, i.e., total cost effectiveness or incremental cost effectiveness, are only required for the technically feasible control technologies.) However, an applicant proposing the top control alternative need not provide cost and other detailed information in regard to other control options. If the applicant accepts, or selects, the top alternatives in the listing as BACT, the applicant proceeds to consider whether impacts of unregulated air pollutants or impacts inother media would justify selection of an alternative control option. If no such issues are identifed, the analysis is ended and the results are proposed as BACT.
5. Select BACT/LAER.

EPA and State maintained RACT/BACT/LAER Clearinghouses (RBLCs) are considered as principal references for identifying potential control technologies and emission rates used in past permitting of similar sources. These databases were queried for entries since January 2000 involving combustion auxiliary boilers. The emission rates proposed are consistent with the entries in the various State and EPA databases for past (post-2000) BACT/LAER evaluations, especially those for sources with similar MMBtu/hr and MW ratings.

Additionally, CARB guidance recommends that the following criteria should be used in determining whether an emissions unit belongs to a class or category of source for which a control technology has been achieved in practice:

A. Source Size (e.g., rating or capacity): The degree of needed similarity may vary based on the equipment type and size. In general, size thresholds that signify a change in emission producing characteristics of the equipment provide for a reasonable delineation based on size. Generally accepted size designations (e.g., small, medium, and large) for a piece of equipment may also be used in defining a class or category of source. It should be noted that EPA does not consider size in defining a class or category of source.

B. Capacity Factor: Limited use, standby, or seasonal equipment are not usually lumped together with full time equipment in a single class or category.

C. Unique Operational/Technological Issues: Certain operational needs and characteristics can impact the effectiveness of a control technology or process.

Operational or technological needs with demonstrable impact on effectiveness or reliability of basic equipment, operation, process, or control technology that are essential to successful operation of an emission unit and cannot be overcome by other reasonable measures can be used in defining a class or category of source. Also, in certain situations, available pre-existing resources at a facility play a key role in rendering certain control technologies feasible. Requiring similar controls at facilities that do not have the same existing resources may not be advisable.

It should be noted that different BACT/LAER control levels may be established within the same class and category of source for varying operational modes. For instance, for gas turbines BACT/LAER levels during startup/shutdown conditions may differ from BACT/LAER levels under steady-state load conditions.

Achieved in Practice Determinations

For an emission or performance level to be achieved in practice for a class or category of source, it should be commercially available, have demonstrated reliability of operation, and have a documented effectiveness verified by acceptable forms of emission or performance measurement.

A. Commercial Availability: At least one vendor should offer the control technology or equipment able to reach an achieved-in-practice emission limit or performance requirement for regular or full-scale operation within the United States. (On the federal level, determinations made outside of the US should also be considered. These considerations, in some instances, can be very difficult to include due to the lack of an organized clearinghouse for compilation of data.)

B. Reliability in Operation: The control technology or equipment should have operated for a reasonable time period in a manner that would provide an expectation of continued reliability. It is not necessary that the equipment operation be continuous, but that the equipment operate reliably in a manner typical of the class or category of source.

C. Effectiveness: The control technology or equipment should be verified to perform effectively over the range of operation expected for the class or category of source. If the control technology or equipment will be allowed to operate at lesser effectiveness during certain modes of operation, then those modes of operation must be identified. The verification should be based on a performance test or tests, when possible, or other performance data.

Any control technology listed in a permitting agency's BACT/LAER Clearinghouse must be considered in establishing BACT/LAER requirements for that class or category of source. However, prior to accepting another agency's BACT/LAER determination as having been achieved in practice for a class and category, the permitting agency should verify that the technology has been achieved in practice in accordance with the above guidelines. Existing information should be used to the extent needed to prove that the technology has been achieved in practice.

Technology Transfer

Control technologies previously achieved in practice for a class and category of sources and/or other technologically feasible controls should be considered for transfer to other class or category of sources. Potentially transferable control technologies may be either add-on exhaust stream controls, or process controls and modifications. For the first type, technology transfer should be considered between sources that produce similar exhaust streams. For the second type, technology transfer should be considered between sources with similar processes.

The "top-down" procedure is generally followed for the BACT/LAER analyses for the pollutants evaluated in this analysis, with a focus on identifying emission limitations or control technologies that are achieved in practice and technically feasible. The following sections present the BACT/LAER analyses and proposed NO_x, CO, PM_{10}, VOC, and SO_2 limits and controls.

Section 2 - BACT Analysis for the Auxilliary Boiler

The proposed auxiliary boiler at the SEC facility is described as follows:

Boiler Parameter	Parameter Rating
Fuel	Natural Gas
Heat Rating	130.33 mmbtu/hr
Maximum daily hours of operation	24
Maximum annual hours of operation	8760
Proposed NOx Controls	LNBs/FGR with SCR, 5 ppmvd
Proposed CO Controls	GCP, 50 ppmvd
Proposed VOC Controls	GCP, 10 ppmvd
Proposed $PM_{10/2.5}$ and SOx Controls	Natural Gas/Clean Fuel
$PM_{10/2.5}$ Emission Rate	0.007 lbs/mmbtu (HHV)

The proposed aux boiler emissions as presently quantified are as follows (based on the above ratings and operations data at steady state normal operating conditions):

Pollutant	Lbs/hr	Lbs/day	Tons/yr
NOx	0.73	17.52	3.34

CO	4.82	115.73	21.12
VOC	0.52	12.51	2.29
SOx	0.39	9.38	1.72
$PM_{10/2.5}$	0.91	21.9	3.99

The table below presents the BACT proposal for the auxiliary boiler based upon the data presented in this analysis.

BACT Pollutant	BACT Limit	Proposed BACT System
NOx	5 ppmvd	Low NOx Burners with FGR and SCR
CO	50 ppmvd	Good Combustion Practices (GCP)
VOC	10 ppmvd	GCP, Sole use of PUC Grade Natural Gas
SOx	0.003 lb/mmbtu	Sole use of PUC Grade Natural Gas
$PM_{10/2.5}$	0.007 lb/mmbtu	Sole use of PUC Grade Natural Gas
NH3 Slip	5 ppm	n/a

A summary of BACT determinations or BACT requirements for similar sized boilers as derived from several of California's air districts and the EPA RBLC database are presented below.

As described in Section 5.2, the auxiliary boiler will be a 130.33 MMBtu/hr natural gas-fired unit. This boiler will be used to implement the fast start technology proposed for the gas turbines. Estimated operating hours are anticipated to be approximately 8760 hours per year.

Bay Area Air Quality Management District – The BAAQMD has established a CO BACT guideline specifying good combustion practices in conjunction with a ULNB/flue gas recirculation (FGR) system, meeting a CO emission limit of 50 ppmv @ 3% O2 for natural gas-fired boilers rated at 50 MMBtu/hr or more. The BAAQMD has further established, for this boiler category, a NOx BACT guideline specifying a ULNB/FGR system, meeting a NOx emission limit of 9 ppmv @ 3% O2. The boilers for which the BAAQMD established its NOx BACT determination are three 97 MMBtu/hr boilers at the Genentech facility located in South San Francisco, California. The Genentech boilers are equipped with ULNB/FGR systems meeting a NOx emission limit of 9 ppmv @ 3% O2. The BACT range of values per the latest tabulation for this source category (Doc# 17.3.1, 8-4-10) is as follows:

- NOx 25-40 ppm @ 3% O2 (ULNB or LNB with FGR)
- CO 100 ppm @ 3% O2 (GCP and natural gas)

The BAAQMD has recently adopted Regulation 9 Rule 7 which establishes a NOx limit for units in the range of the proposed aux boiler at 5ppmvd @ 3%O2.

San Joaquin Valley Air Pollution Control District – The SJVAPCD recently rescinded its BACT determinations for boilers. Previously, however, the SJVAPCD had established natural gas fuel with a liquefied petroleum gas backup as BACT for CO emissions for natural gas-fired boilers rated at 20 MMBtu/hr or more. The SJVAPCD had also established a NOx BACT guideline specifying an ultra low-NOx burner (ULNB) system, meeting a NOx emission limit of 9 ppmv @ 3% O2, for natural gas-fired boilers rated at 20 MMBtu/hr or more and operated within the operational response range of the ULNB system. The largest boiler for which the SJVAPCD had published a NOx BACT determination is a

182 MMBtu/hr boiler at the Los Gatos Tomato facility located in Huron, California. The Los Gatos Tomato boiler is equipped with an ULNB system meeting a NOx emission limit of 9 ppmv @ 3% O2.

San Diego Air Pollution Control District – Data derived from the San Diego APCD BACT database for boiler rated at greater than 50 but less than 250 mmbtu/hr indicates that BACT for NOx, for non-base loaded process units is typically 9 ppm @ 3% O2, utilizing LNBs and FGR, with natural gas fuel. No CO BACT limit is listed.

South Coast Air Quality Management District – The SCAQMD does not publish a single governing BACT guideline for major sources (comparable in size to the proposed boilers), but rather maintains a database of historical BACT determinations. The largest boilers for which the SCAQMD has published a BACT determination (February 2006) are two 2,088 MMBtu/hr utility boilers at the AES Huntington Beach facility located in Huntingdon Beach, California. The AES utility boilers are equipped with a LNB/FGR, selective catalytic reduction (SCR), and oxidation catalyst systems meeting CO and NOx emission limits of 5 ppmv @ 3% O2 each. The next largest boiler for which the SCAQMD has published a BACT determination (October 1999) is a 110 MMBtu/hr boiler at the Darling International facility located in Los Angeles, California. The Darling International boiler is equipped with a LNB/FGR and SCR system meeting CO and NOx emission limits of 100 ppmv @ 3% O2 and 9 ppmv @ 3% O2, respectively.

Other Control Technology Determinations – The Mojave Desert AQMD issued a Final Determination of Compliance (2009) for the Ivanpah Solar Electric Generating System, which includes large superheating steam boilers similar to those proposed for the Rio Mesa SEGF. Emissions from those boilers were below the MDAQMD's BACT thresholds and were therefore not subject to BACT. The emission limits for the Ivanpah boilers (249 MMBtu/hr heat input) were 9 ppmc NOx, 12.6 ppmc VOC, and 25 ppmc CO. The proposed limits for the SEC boiler is consistent with these limits, with the exception of a higher proposed CO limit for the auxiliary boilers. However, the proposed 50 ppmc CO limit for the auxiliary boiler is consistent with the BAAQMD CO BACT guideline.

Analysis of Control Requirements for Nitrogen Oxides

Identify Potential Control Technologies

The baseline NO_x emission rate for this analysis is considered to be 0.10 lb/MMBtu for the boiler, based on the applicable New Source Performance Standards (40 CFR Part 60, Subpart Db). The Subpart Db emission rate provides a comparison for the evaluation of control effectiveness and feasibility. The maximum degree of control, which results in the lowest NO_x emission rate, is a combination of low-NO_x burners (LNB) in conjunction with selective catalytic reduction (SCR). Note that as an auxiliary boiler, the operation of the boiler will be limited to 8000 hours/year.

As with other combustion sources, NO_x emissions from boilers can be reduced by combustion controls and post-combustion flue gas treatment. Combustion controls include low-NO_x burners and other combustion modifications, which act to reduce the formation of NO_x during the combustion process. Post-combustion controls remove NO_x from the exhaust stream after it is generated. Potential NO_x control technologies for the boiler include the following:

- Low-NO_x burners (LNB)
- Flue gas recirculation (FGR)
- LNB and FGR
- $SCONO_x$
- Selective catalytic reduction (SCR)

- Selective non-catalytic reduction (SNCR)

Evaluate Control Technologies for Technical Feasibility

The performance and technical feasibility of the NO_x controls listed above are discussed separately. Combustion controls are discussed first, and a discussion of the post-combustion controls SCR and SNCR follows. The proposed boiler will be fired with only natural gas and be well-maintained and operated with good combustion practices, thus these control options are not discussed separately below.

- **Low-NO_x Burners (including Ultra Low-NOx Burners)**

Low-NO_x burners (LNB) and ULNBs have been developed over the last few decades by applying combustion modifications to "conventional" burners. Low-NO_x burners are very common and there are many variations available from numerous manufacturers. A LNB is a packaged assembly that uses staged combustion techniques to reduce the formation of thermal NO_x. The purposes of LNB are to reduce the amount of oxygen in critical NO_x formation zones, to modify the introduction of air and fuel so that the rate of mixing is slowed, and to reduce the amount of fuel burned at the peak flame temperature. There are two basic types of LNB, air-stage and fuel-staged. Both types of LNB achieve the above objectives, thus, emissions are reduced when compared with conventional burners.

- **Flue Gas Recirculation**

As the name implies, with FGR a portion of the flue gas is recirculated and mixed with the combustion air supply. For new boiler installations, this is usually accomplished with a larger forced draft fan, as compared to that required without FGR. The objective of FGR is to lower the amount of oxygen available to react with nitrogen and reduce the flame temperature, both of which reduce the formation of NO_x. One drawback to FGR is that efficiency is somewhat reduced due to the additional power requirements of the larger fan. The addition of FGR to a LNB assembly can result in further reductions in thermal NO_x formation.

- **$SCONO_x$ for Boilers**

$SCONO_x$ for boilers, as with $SCONO_x$ for turbines, involves a catalyst system initially produced and marketed by Goal Line Environmental Technologies. Other suppliers and marketers are now supposedly offering the technology. In early 2000, the South Coast AQMD BACT database listed an entry in its BACT determinations for "other technologies" (i.e., those that do not qualify as LAER) from April 2000 for $SCONO_x$ applied to a 4.2 MMBtu/hr boiler at a facility within the SCAQMD. No such listing could be found in the SCAQMD BACT database during this analysis, and the applicant could not find any listings for a SCONOx application on any small auxiliary type boilers.

Data compiled by the Energy Solutions Center (DG Consortium, 2004) indicates the following; "the SCONOX system is a new catalytic reduction technology that has been developed and is currently being made available for natural gas-fired turbines. It is based on a unique integration of catalytic oxidation and absorption technology. CO and NO are catalytically oxidized to CO2 and NO2. The NO2 molecules are subsequently absorbed on the treated surface of the SCONOX catalyst. The system manufacturer, EmerChem, guarantees CO emissions of 1 ppm and NOx emissions of 2 ppm. The SCONOX system does not require the use of ammonia, eliminating the potential of ammonia slip conditions evident in existing SCR systems. Only limited emissions data were available for a gas turbine equipped with a SCONOX system. This data reflected HAP emissions and was not sufficient to verify the manufacturer's claims."

EmeraChem, which is a supplier and licenser of the EMx (SCONOX) technology claims on its website that "EMx is a multi-pollutant technology that significantly reduces NOx, SOx, CO, VOC, and PM for gas-fired turbines to ultra low levels (< 1 ppm for all criteria pollutants). The next generation of SCONOx is a multi-pollutant technology in a single system that significantly reduces NOx, SOx, CO, VOC, and PM for air emission requirements. The U.S. EPA declared this technology "the Lowest Achievable Emission Rate" (LAER) for NOx abatement, establishing the standard against which all future emission reduction means will be measured. EMx is the most effective Ammonia Free Reduction (AFR) technology available today for gas turbine (GT), reciprocating engines (IC), and industrial/utility boilers (IB)." To date, the applicant does not believe that any of these claims have been substantiated. The EmeraChem website is replete with such statements, but lacks any actual technology application data, results, operational histories, etc. In addition, the EmeraChem website clearly states that the application of EMx (SCONOx) on commercial/industrial boilers is a future application. Furthermore, they state that a "pilot" unit showed emissions reductions on the order of 95%. Based upon our understanding of the current BACT guidelines, a pilot unit does not establish "achieved in practice".

In the above sections of this analysis a discussion was presented of the criteria used for determining whether a control is achieved in practice. Commercial availability for boiler applications requires that a commercial guarantee is available from the vendor. Given that this technology may have only been applied to one source (which cannot at this time be confirmed), the availability of a commercial guarantee for a much larger boiler is seriously in question. Also, the reliability of $SCONO_x$ on a larger boiler has not been demonstrated. Thus, sufficient data to evaluate the reliability of $SCONO_x$ has not been generated. Also, the effectiveness of $SCONO_x$ on a large boiler has not been demonstrated. As a result of these factors, this control is not considered technically feasible for the proposed boiler.

- **Selective Catalytic Reduction**

Selective catalytic reduction is a post-combustion flue gas treatment in which NO_x is reduced to nitrogen and water by injecting ammonia in the presence of a catalyst. The ammonia can be used in either the anhydrous or aqueous form. An ammonia injection grid is located upstream of the catalyst body and is designed to disperse ammonia uniformly throughout the exhaust flow before is enters the catalyst unit. The SCR catalyst is subject to deactivation by a number of mechanisms. Loss of catalyst activity can occur from thermal degradation, if the catalyst is exposed to excessive temperatures over a prolonged period of time, or from chemical poisoning.

SCR has been used extensively on combustion turbines and to a somewhat lesser extent with boilers. The desired level of NO_x control is a function of the catalyst volume and ammonia-to-NO_x (NH_3/NO_x) ratio. For a given catalyst volume, higher NH_3/NO_x ratios can be used to achieve higher NO_x emission reductions, but can result in undesirable increased levels of unreacted ammonia, called ammonia slip. SCR is being proposed for the SEC aux boiler at a NOx emissions rate of 5 ppm, consistent with the BAAQMD Regulation 9 Rule 7 limits.

- **Selective Non-catalytic Reduction**

SNCR is another post-combustion technology where NO_x is reduced by injecting ammonia or urea into a high-temperature region in the boiler exhaust gas path, without the influence of a catalyst. The SNCR technology requires gas temperatures in the range of 1600° to 2100°F. SNCR has been used extensively on boiler applications where consist fuel quality and firing rates can be maintained. For the proposed aux boiler, it is highly unlikely that consistent temperatures in the range of 1600° to 2100°F will be required. In addition, the ammonia or reagent injection grid would have to be positioned inside the package boiler unit to take advantage of the optimum injection temperature and still allow the required residence time to complete the reduction reaction, also highly unlikely in a small package aux boiler system. For these reasons, SNCR was not considered as a feasible BACT alternative for the auxiliary boiler.

Based on the information in this section, the following NO_x control technologies are considered technologically feasible for the proposed boiler:

- Low-NO_x burners (LNB)
- Flue gas recirculation (FGR)
- LNB with FGR
- Selective Catalytic Reduction (SCR).

Rank Technically Feasible Control Technologies by Control Effectiveness

The technically feasible control technologies listed above are ranked by NO_x control effectiveness in the traditional "top-down" format in the table below.

NO_x Control Technologies Ranked by Effectiveness

NO_x Control Alternative	Available?	Technically Feasible?	NO_x Emission Reduction (%)
SCR	Yes	Yes	90
SCONOx	Yes	No	90
LNB with FGR	Yes	Yes	70-90
LNB	Yes	Yes	40-85
FGR	Yes	Yes	40-70

Evaluate Most Effective Controls for BACT

For boilers such as the one proposed, low-NO_x burners have become standard. In addition, from Table 1 the highest level of emission control is provided by SCR. The proposed auxiliary boiler will operate 8760 hours/year. The applicant is proposing to use low-NO_x burners with internal FGR and SCR. The applicant has chosen a technology and an emissions limit which meets BACT for an auxiliary boiler anticipated to be fired up to 8760 hours per year.

Select BACT

The applicant has chosen to apply low-NO_x burners, FGR, SCR, and good combustion practices for the proposed auxiliary boiler. From the "top-down" analysis, this represents an equivalent level to the highest level of control for NO_x. This level of control is consistent with the control technologies listed in the RBLC, and in some cases exceeds the level of control for some recently permitted boilers. The proposed emission rate of 5 ppmvd @ 3% O_2 is also consistent with the lowest rates given in the survey data above.

Analysis of Control Requirements for Carbon Monoxide

Identify Potential Control Technologies

Carbon monoxide (CO) is a product of incomplete combustion. CO formation in a boiler is limited by ensuring complete and efficient combustion of the fuel. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion minimize CO emissions. Measures taken to minimize the formation of NO_X during combustion may inhibit complete combustion, which could increase CO emissions. Lowering combustion temperatures through premixed fuel combustion can be counterproductive with regard to CO emissions. However, improved air/fuel mixing inherent in newer burner designs and control systems limits the impact of fuel staging on CO emissions.

The applicable NSPS does not contain requirements for CO, thus, there is no real baseline emission rate. Based on a review of the information provided in the RBLC database and knowledge related to the control of CO emissions from combustion sources, the following CO control approaches were identified:

- CO oxidation catalyst
- $SCONO_X$
- Good combustion control

Evaluate Control Technologies for Technical Feasibility

Oxidation catalysts have previously been applied to natural gas-fired boilers located in CO nonattainment areas, although not to the same extent as turbines. The catalyst lowers the activation energy for the oxidation of CO to CO_2 so that CO in the exhaust gas is converted to CO_2. There are numerous suppliers of oxidation catalyst systems, and as such this technology has been applied to natural gas-fired boilers of all sizes and is considered a demonstrated technology. The proposed aux boiler would have to be cut in two in order to install a CO catalsyt, assuming of course that the package boiler design allowed for such a separation, and assuming the boiler design would allow the cut at the correct position in the boiler to achieve the correct exhaust gas temperature for the catalyst operation. For these reasons the use of a CO catalyst on a small package boiler is not considered feasible.

The $SCONO_X$ process for boilers was previously discussed as part of the NO_X BACT analysis; it is used to control both NO_x and CO. This control technology has not been achieved in practice and is not considered technically feasible for the proposed small aux boiler.

Good combustion control, as the name infers, is based upon maintaining good mixing, a proper fuel/air ratio, and adequate time at the required combustion temperature. This technology is technically feasible and is the most commonly used technology to control CO emissions. In fact, combustion control/design coupled with a CO catalyst, is the most stringent control technology listed in the RBLC for boilers.

Rank Technically Feasible Control Technologies by Control Effectiveness

The two technically feasible control technologies for CO are an oxidation catalyst and good combustion controls. Good combustion control is generally considered the baseline control technology for CO emissions. Thus, an oxidation catalyst, which is an add-on control technology, is considered the most stringent level of control for CO.

Evaluate Most Effective Controls for BACT

For boilers such as the one proposed, good combustion practices/design are considered standard. Thus, an oxidation catalyst provides the highest level of emission control. The proposed auxiliary boiler will operate less than or equal to 8000 hours/year, and installation of a CO catalyst in the small package boiler is not considered feasible at this time. For these reasons the applicant is not proposing a CO catalyst. As a result, the applicant has chosen a control technology and emissions limit which meets BACT.

Select BACT

The applicant has chosen to apply good combustion practices for the proposed auxiliary boiler. From the "top-down" analysis, this represents a BACT level of control for CO for aux boilers. This level of control equals or exceeds the level of control technologies listed in the RBLC for boilers. The proposed emission rate of 50 ppmvd @ 3% O_2 is also consistent with the lowest rates given in the RBLC (considering the use rate of the proposed boiler). In addition, the limit is consistent with the BAAQMD CO BACT limits for similar boilers using SCR.

Analysis of Control Requirements for PM_{10}

PM_{10} is a Clean Air Act regulated pollutant defined as particulate matter equal to or less than a nominal aerodynamic particle diameter of 10 microns. Particulate matter is typically described as filterable and condensable PM. As presented in the turbine section, the amount of both filterable and condensable PM_{10} emissions from natural gas-fired combustion sources should be very small relative to the total exhaust flow. In addition, PM emissions from add-on control devices are typically higher than from uncontrolled natural gas-fired combustion units. Therefore, add-on PM_{10} controls such as fabric filters (baghouses), ESPs, wet scrubbers, venturi scrubbers, and coarse PM separation technologies such as cyclones and multi-clones, do not make practical sense and are not considered feasible or cost effective for utility natural gas-fired aux boilers.

Permit data from EPA's RBLC database beginning with January 1990 were searched for PM and PM_{10} BACT decisions and corresponding limit. In particular, data listed for similarly sized natural gas-fired boilers were reviewed in detail. Review of the RBLC database indicates PM/PM_{10} limits in the range of 0.001 – 5.0 lb/MMBtu. The PM_{10} emission rate for the proposed boiler is at the lower end of the range, at approximately 0.007 lb/MMBtu. As noted before, it is difficult to make a direct comparison to the results in the RBLC because it is unclear as to whether the emission rate contained in the database includes both condensable and filterable PM.

In conclusion, because the proposed boiler will fire clean burning natural gas, and its combustion controls will be state-of-the-art, add-on controls are not considered feasible. Particulate emissions from the proposed unit will be controlled via proper design, operation, and maintenance. With respect to combustion controls, there are no significant toxic emissions, economic, energy, or environmental impacts.

Analysis of Control Requirements for VOC

This section presents the BACT analysis for VOC for the proposed natural gas-fired aux boiler. The VOC emissions from natural gas-fired combustion sources are the result of two possible formation pathways: incomplete combustion, and recombination of the products of incomplete combustion. The proposed boiler incorporates state-of-the-art combustion technology and is designed to achieve high combustion efficiencies. Additionally, the recombination of products of incomplete combustion is unlikely in well-controlled boilers because the conditions required for recombination are not present. As a result, the proposed boiler has a very low expected VOC emission rate.

Based on a review of the information provided in the RBLC database and knowledge related to the control of VOC emissions from combustion sources, and taking into account technology transfer from other combustion sources, the following VOC control approaches were identified:

- Thermal oxidation,
- Catalytic oxidation, and
- Good combustion practices (GCP), design, and operation.

Thermal oxidizers are used for combustion systems where VOC rates are high, such as waste incinerators. The thermal oxidizers for these types of sources are in the form of secondary combustion chambers and afterburners and are inherent to the combustion system's design. The VOC emissions from these types of sources are much higher because they combust fuels that are heterogeneous in nature and as a result it is difficult, if not impossible, to maintain the uniform time, temperature, and turbulence needed to ensure complete combustion. Thermal oxidation systems work by raising the VOC containing stream to the combustion temperature to allow the combustion process sufficient time to reach completion. The controlled VOC rates from these systems are still higher than those being proposed for this project without VOC control. Also, because thermal oxidizers combust fuel, a significant amount of NO_x emission can be generated. As such, thermal oxidizers are not considered further in this anlaysis.

Oxidation catalysts have traditionally been applied to the control of CO emissions from clean fuel fired combustion sources located in CO nonattainment areas. As discussed previously, this technology uses precious metal based catalysts to promote the oxidation of CO and unburned hydocarbon (of which a portion is VOC) to CO_2. The amount of VOC conversion is compound specific and a function of the available oxygen and operating temperature. See the CO catalyst discussion in the CO BACT section above for more data on the technical feasibility of this control option on small package boilers.

Good combustion design and operation is the primary approach used to control VOC emissions from combustion sources. The VOC controls, inherent in the design and operation of a unit, include the use of clean fuels such as natural gas, and advanced process controls to ensure complete combustion and the best fuel efficiency. The proposed boiler will be 100% natural gas-fired and is designed with state-of-the-art combustion controls to maximize conversion of the natural gas to CO_2, and minimize the production of VOC and CO.

Use of clean fuels (natural gas), and good combustion practices, are being proposed to control CO emissions, and such systems can also achieve VOC reductions. The proposed VOC emission rate is 10 ppmvd @ 3% O_2, which is consistent with low end values from the RBLC for similar-sized boilers and represents BACT for VOC.

Analysis of Control Requirements for SO_2

The new boiler will be designed and operated to minimize emissions and will be fired solely with natural gas, which is inherently low in sulfur. Sulfur dioxide is formed during combustion due to the oxidation of the sulfur in the fuel. Add-on control devices (e.g., wet or dry scrubbers, flue gas desulfurization) are typically used to control emissions from combustion sources firing higher sulfur fuels, such as coal. Flue gas desulfurization is not appropriate for use with low sulfur fuel, and is not considered for this project, because the achievable emission reduction is far too small for this option to be cost-effective. Also, the proposed emission rate of ~0.003 lb/MMbtu is consistent with the lowest emission rates listed in the RBLC.

Cost Effectiveness and Other Impacts

Pursuant to the NSR/PSD Workshop Manual (10/99, Chapter B, page B.8) the applicant has chosen BACT limits which are equivalent to the top control alternatives for small auxiliary boilers, and as such it is not necessary to provide cost and other detailed information in regard to other control options. Based on the options chosen, the applicant is not aware of any additional toxics, energy, or other environmental media impacts that would result from the chosen BACT options.

Appendix 3.1F
Offset/Mitigation Support Data

Offset Listing

The SEC modification project, pursuant to the FRAQMD NSR rules, is required to purchase or acquire sufficient emission reduction credits to offset the proposed project emissions due to its current status as a major source. FRAQMD offset thresholds are implemented on a "facility" basis. For new facilities the offset thresholds are compared to the facility potential to emit (PTE) taking into account the location of the facility within the air district. For modifications to existing major sources, offsets are required for the net emissions increase if the existing emissions are above the offset thresholds. NSR rule required amounts of ERCs (mitigation) are delineated in Table 3.1F-1.

TABLE 3.1F-1 FRAQMD REGULATION 10.1 MITIGATION REQUIREMENTS

	Emission Reduction Credits (tons/yr)				
	PM_{10}	**VOC**	**NO_x**	**SO_2**	**CO**
FRAQMD Facility Offset Thresholds	>25	>25	>25	n/a	n/a
SEC Current Offset Holdings*	92.4	23.7	205	0	0
Aux Boiler PTE Values	3.99	2.29	3.34	1.72	21.12
FRAQMD Required Mitigations	3.99	2.29	3.34	0	0

* Values derived from the current Title V/PTO dated 7-30-10. Values are the quarterly totals converted to tpy.
PM2.5 offsets are not required for the aux boiler modification.
Offset distance ratios and interpollutant offset provisions not included.

SEC will submit a detailed mitigation/offset plan to the CEC and the FRAQMD for review and implementation on a timetable compliant with the requirements of Rule 10-1.

Appendix 3.1G
Cumulative Emissions Data

Cumulative Impacts Analysis Protocol

Potential cumulative air quality impacts are not expected to occur or result from the modified Sutter Energy Center (SEC) due to the following; (1) the low emissions from SEC, (2) the low predicted impacts, and (3) the lack of any major sources within an 6 mile radius of the site. A cumulative analysis is not warranted at this time. If such an analysis is deemed necessary, the cumulative impacts will be evaluated as follows.

Regional Impacts

Regional air quality impacts are possible for pollutants such as ozone, which involve photochemical processes that can take hours to occur. SEC is required, per the FRAQMD NSR Rule to supply emissions mitigation (see Appendix 3.1F), and in addition, mitigation for some other pollutants may be required by the CEC.

Although the relative importance of VOC and NO_x emissions in ozone formation differs from region to region, and from day to day, most air pollution control plans in California require roughly equivalent controls (on a ton per year basis) for these two pollutants. The change in emissions of the sum of these pollutants, equally weighted, will be used to provide a reasonable estimate of the impact of SEC on ozone levels. The net change in emissions of ozone precursors from SEC will be compared with emissions from all sources within the FRAQMD (Table 3.1G-1).

Table 3.1G-1 Estimated FRAQMD (Sutter County) Emissions Inventory for 2010 (tons/day)

Source Category	TOG	ROG	CO	NOx	SOx	PM10	PM2.5
Total Stationary Sources	11.8	3.6	1.5	4.0	0	1.6	0.9
Total Area Sources	5.9	2.9	10.5	0.7	0.1	12.2	2.8
Total Mobile Sources	3.9	3.6	27.5	13.0	0	0.6	0.5
Total Natural Sources	3.6	3.2	-	-	-	-	-
County Total (tons/day)	25.2	13.2	39.5	17.7	0.1	13.5	4.2
County Total (tons/yr)	9198	4818	14418	6461	37	4928	1533

Source: CARB, 12/2012.

Air quality impacts of fine particulate, PM_{10} and/or $PM_{2.5}$, have the potential to be either regional or localized in nature. On a regional basis, an analysis similar to that proposed above for ozone will be performed, looking at the three pollutants that can form PM_{10} in the atmosphere, i.e., VOC, SO_x, and NO_x, as well as directly emitted particulate matter. For existing major stationary sources, the FRAQMD regulations require offsets to be provided for PM_{10}, NOx, and VOC, for the net emissions increase above 25 tpy. The existing threshold for $PM_{2.5}$ emissions is 100 tpy.

As in the case of ozone precursors, emissions of $PM_{10/2.5}$ precursors are expected to have approximately equivalent ambient impacts in forming $PM_{10/2.5}$, per ton of emissions on a regional basis. Table 3.1G-2 provides the comparison of emissions of the criteria pollutants from SEC with emissions from all sources within the County as a whole.

Table 3.1G-2 Comparison of SEC Aux Boiler Emissions to Estimated Inventory for 2010

Category	TOG	ROG[1]	CO	NOx	SOx	PM10	PM2.5
SEC Aux Boiler Emissions (tons/yr)	-	2.29	21.12	3.34	1.72	3.99	3.99
County Total (tons/yr)	9198	4818	14418	6461	37	4928	1533
SEC % of AQMD Total (basis Tons/yr)	-	**.048**	**.146**	**.052**	**4.65**	**.081**	**.26**

[1] SEC Aux Boiler VOC emissions compared to inventory ROG emissions.

Localized Impacts

Localized impacts from SEC could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted PM_{10}. A dispersion modeling analysis of potential cumulative air quality impacts will be performed for all four of these pollutants.

In evaluating the potential cumulative localized impacts of SEC in conjunction with the impacts of existing facilities and facilities not yet in operation but that are reasonably foreseeable, a potential impact area in which cumulative localized impacts could occur was identified as an area with a radius of 8 miles around the plant site. Based on the results of the proposed air quality modeling analyses described above, "significant" air quality impacts, as that term is defined in federal air quality modeling guidelines, will be determined. If the project's impacts do not exceed the significance levels, no cumulative impacts will be expected to occur, and no further analysis will be required. Otherwise, in order to ensure that other projects that might have significant cumulative impacts in conjunction with SEC are identified, a search area with a radius of 6 miles beyond the project's impact area will be used for the cumulative impacts analysis. Within this search area, three categories of projects with emissions sources will be used as criteria for identification:

- Projects that have been in operation for a sufficient time period, and whose emissions are included in the overall background air quality assessment.
- Projects which recently began operations whose emissions may not be reflected in the ambient monitoring background data.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

The applicable inclusion dates for each of the above source categories will be discussed and approved by the FRAQMD staff. The requested source listings will incorporate these dates. Projects that are existing, and that have been in operation such that their emissions are reflected in the ambient air quality data that has been used to represent background concentrations require no further analysis. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational will be identified through a request of permit records from the FRAQMD. The search will be requested to be performed at two levels. For permits that are considered "major modifications" (i.e., emissions increases greater than 40 tons/year of NO_x or SO_2, 25 tons/year of total suspended particulate, 15 tons/year of PM_{10}), a region within 6 miles of the proposed project site will be evaluated. For projects that had smaller emissions changes, but still greater than 15 tons/year, a region within 6 miles of the proposed project site will also evaluated. Projects that satisfy either of these criteria and that had a permit to construct issued after the applicable inclusion date, will be included in the cumulative air quality impacts analysis. The inclusion date, as noted above, will be selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the current ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 15 tons/year will be assumed to be *de minimus*, and will not be included in the dispersion modeling analysis.

A list of projects within the project region meeting the above noted criteria will be requested from the FRAQMD staff if it is determined that a cumulative analysis is warranted.

Given the potentially wide geographic area over which the dispersion modeling analysis is to be performed, the Aermod model will be used to evaluate cumulative localized air quality impacts. The detailed modeling procedures, Aermod options, and meteorological data used in the cumulative impacts dispersion analysis were the same as those described in Section 3.1. The receptor grid will be spaced at 100 meters and cover the area in which the detailed modeling analysis (described above) indicates that the project will have impacts that may exceed any significance levels.

Cumulative Impacts Dispersion Modeling

The dispersion modeling analysis of cumulative localized air quality impacts for the proposed project will be evaluated in combination with other reasonably foreseeable projects and air quality levels attributable to existing emission sources, and the impacts were compared to state or federal air quality standards for significant impact. As discussed above, the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on short-term averaging periods (24 hours or less).

Supporting information to be used in the analysis includes the following:

- 2010 estimated emissions inventory for Sutter County (Table 3.1G-1);
- List of projects resulting from the screening analysis of permit files by the FRAQMD;
- Table delineating location data of sources included in the cumulative air quality impacts dispersion modeling analysis;
- Stack parameters for sources included in the cumulative air quality impacts dispersion modeling analysis; and output files for the dispersion modeling analysis.

Appendix 3.1H
FRAQMD Permit Application Forms

APPENDIX 3.1H

Air District Permitting Application Forms

This appendix contains the applicable air district permitting application forms for the identified devices and/or processes subject to district permitting jurisdiction. These application forms in conjunction with the amended sections of Volumes I and II of the AFC (specifically the Project Description Section, the Air Quality Section, and the Public Health Section) constitute the facility's application for a Permit to Construct pursuant to FRAQMD Rule 10.1.

Forms included:

- Standard District permit application and source specific forms.

Feather River Air Quality Management District

Application for Authority to Construct / Permit to Operate

Cover Form – all applications

Serving Sutter and Yuba Counties

1007 Live Oak Blvd Suite B-3
Yuba City, CA 95991
(530) 634-7659
FAX (530) 634-7660
www.fraqmd.org

David A. Valler, Jr.
Air Pollution Control Officer

IF APPLICABLE, PLEASE COMPLETE THE ASSOCIATED SUPPLEMENTAL FORM FOR EACH PIECE OF EQUIPMENT OR PROCESS

Please provide all information requested in this application. Fill in the information exactly as you would like it to appear on the permit (including punctuation, capitalization, and abbreviations). **Incomplete applications will delay processing**. Attach extra pages as necessary. Construction must not be started until the Authority to Construct has been issued.

Filing Fee $125.00 (non-refundable and to be submitted with this application)

Additional fees will be assessed pursuant to District Rule 7.7 at an hourly rate to cover costs of assessment, processing, and evaluation of the application. Inspections of the site and Hearing Board costs are additional. These fees do not include State costs incurred pursuant to Section 44380 of the California Health and Safety Code.

Fees are subject to change. If you store blank forms, please check with the District for updated information before filing.

SECTION I FACILITY INFORMATION		**FRAQMD PERMIT # (if existing):**	13005
FACILITY NAME (AS IT WILL APPEAR ON PERMIT):	SUTTER ENERGY CENTER		
FACILITY LOCATION / ADDRESS:	5029 SOUTH TOWNSHIP ROAD		
CITY:	YUBA CITY	STATE: CA	ZIP CODE: 95993
CONTACT PERSON:	CHARLES RANDALL	TITLE:	EHS SPECIALIST II
PHONE:	530-821-2074	FAX:	530-821-2065
E-MAIL:	CHARLES.RANDALL@CALPINE.COM	SIC CODE:	4911

SECTION II PERMIT TO OPERATE MAILING / BILLING INFORMATION

NOTE: THIS IS WHERE ANNUAL RENEWAL INVOICES AND PERMITS WILL BE MAILED TO			
COMPANY NAME:	CALPINE CONSTRUCTION FINANCE COMPANY, L.P.		
MAILING ADDRESS:	5029 SOUTH TOWNSHIP ROAD		
CITY:	YUBA CITY	STATE: CA	ZIP CODE: 95993
MAILING CONTACT:	CHARLES RANDALL	TITLE:	EHS SPECIALIST II
PHONE:	530-821-2074	FAX:	530-821-2065

SECTION III CONTRACTOR / BILLING INFORMATION (for Authority to Construct Permit)

WILL BOTH AUTHORITY TO CONSTRUCT INVOICES BE BILLED TO THIS ADDRESS?	YES:		NO:
COMPANY NAME:	* SAME AS ABOVE		
MAILING ADDRESS:			
CITY:		STATE:	ZIP CODE:
MAILING CONTACT:		TITLE:	
PHONE:		FAX:	
E-MAIL:			

FOR FRAQMD USE ONLY

RECEIPT #: ________ DATE: ________ RECEIVED BY: ________ **FACILITY ID:** ________ **A/C#:** ________

Application for Authority to Construct / Permit to Operate – Cover Form

SECTION IV CONSTRUCTION SCHEDULE & SCOPE OF WORK

ESTIMATED START DATE:	TBD	ESTIMATED COMPLETION DATE:	TBD
FOR EXISTING SOURCES, ENTER DATE INSTALLED:			

DESCRIBE THE SCOPE OF THE WORK TO BE PERFORMED AND LIST EQUIPMENT TO BE CONSTRUCTED, MODIFIED, OR PUT UNDER PERMIT. ATTACH FEATHER RIVER AQMD SUPPLEMENTAL FORM(S) AND SUPPORTING DOCUMENTATION AS NECESSARY. THE DISTRICT RESERVES THE RIGHT TO REQUEST ADDITIONAL INFORMATION IF NEEDED.

SEE AMENDMENT APPLICATION DOCUMENT
AND APPLICABLE APPENDICES.

Attach additional sheets as necessary.

SECTION V CONFIDENTIAL INFORMATION

All information submitted to obtain an Authority to Construct/Permit to Operate is considered public information as defined by California Government Code section 6254.7 unless specifically marked as a trade secret by the applicant. Each document containing trade secrets must be separated from all non-privileged documents. Each document, which is claimed to contain trade secrets, must indicate each section or paragraph that contains trade secret information and must have attached a declaration stating with specificity the reason this document contains trade secret information. All emission data is subject to disclosure regardless of any claim of trade secret.

Acknowledgement [LS] (Please Initial)

Trade Secret documents are included with this application: ☐ Y ☒ N

SECTION VI NEAREST SCHOOL

If the emission source is within 1,000 feet of a school site and the application will result in an increase in hazardous air emissions, a public notice will be required at the expense of the applicant. (CH&S 42301.6)

"School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes. (CH&S 42301.9(a))

Pursuant to 42301.6(f) of the California Health and Safety Code, I hereby certify that the emission source(s) in this permit application:

(Initial appropriate box)

☐ **Is within 1,000 feet of the outer boundary of a school.**

☒ **Is not within 1,000 feet of the outer boundary of a school.**

NEAREST SCHOOL AND DISTANCE (IN FEET) NAME: BARRY ELEMENTARY, 19800 FEET

SECTION VII APPLICANT CERTIFICATION STATEMENT

Applicant agrees to defend (with legal counsel reasonably acceptable to FRAQMD), indemnify and hold harmless FRAQMD, its officers, employees, and agents, from and against any and all claims, losses, costs, damages, injuries (including injury to or death), expenses and liabilities of every kind, nature and description (including incidental and consequential damages, court costs, attorneys' fees, litigation expenses and fees of expert consultants or expert witnesses incurred in the connection therewith and costs of investigation) that arise out of, pertain to, or relate to, directly or indirectly, in whole or in part, this permit and/or the application or issuance thereof. To the extent that FRAQMD is required to use any of its resources to respond to such claim, action, or proceeding, Applicant will reimburse FRAQMD upon demand and upon presentation of an invoice describing the work done, the time spent on such work, and the hourly rate for such work by the employee or agent of FRAQMD.

I certify under penalty of perjury under the laws of the State of California, based on information and belief formed after reasonable inquiry, that the information contained in this application, composed of the forms and attachments, is true, accurate, and complete, and that I am the responsible official.

RESPONSIBLE OFFICIAL SIGNATURE: Larry Sessions

NAME (PRINTED): LARRY SESSIONS TITLE: General Manager DATE: 2/21/13

BOILERS, STEAM GENERATORS, AND PROCESS HEATERS SUPPLEMENTAL FORM

Section I - Facility/Owner Information

1.1. Business Name: SUTTER ENERGY CENTER

1.2. Contact Name: CHARLES RANDALL

Phone No.: 530-821-2074 Fax No.: 530-821-2065 E-mail: CHARLES.RANDALL@CALPINE.COM

Address: 5029 SOUTH TOWNSHIP RD., YUBA CITY, CA. 95993

1.3. Address of Boiler: SAME AS ABOVE

1.4. FRAQMD Permit No.: 13005 (if unknown, leave blank)

1.5. Do you claim confidentiality of data? ☒ No ☐ Yes (attach explanation)

Section II - General Equipment Information (Complete all items to the best of your ability)

2.1. Type of Equipment:

☒ Boiler ☐ Steam Generator ☐ Process Heater ☐ Other (specify): ______

2.2. Equipment Manufacturer: RENTECH (OR EQUIVALENT)

2.3. Equipment Model: ______ Serial Number: ______

2.4. Year of Manufacture: 2013 Year of Installation: 2013

2.5. Equipment Rating: 130.33 MMBtu/hr (input) OR ______ horsepower (hp)

2.6. Fuel Information:

☐ Diesel ☒ Natural Gas ☐ Propane/LPG ☐ Gasoline ☐ Digester Gas

☐ Landfill Gas ☐ Other Fuel: ______ ☐ If Dual Fuel: ______

2.7. Tracking Equipment: ☐ Hour Meter ☒ Dedicated Fuel Meter ☐ None

2.8. Burner Information:

A. Primary Burner Manufacturer: RENTECH Model: ______

Maximum Heat Input Rating 130.33 MMBtu/hr

Type: ☐ Standard ☒ Low NOx ☐ Ultra Low NOx

B. Secondary Burner Manufacturer: N/A Model: ______

Maximum Heat Input Rating ______ MMBtu/hr

Type: ☐ Standard ☐ Low NOx ☐ Ultra Low NOx

BOILERS, STEAM GENERATORS, AND PROCESS HEATERS SUPPLEMENTAL FORM

Section II - General Equipment Information (Complete all items to the best of your ability)

2.9. Additional Emission Control Devices (Check all that apply) :

- [x] Flue Gas Recirculation (FGR)
- [ ] Staged Air Combustion
- [ ] Staged Fuel Combustion
- [ ] Selective Non-catalytic Reduction (SNCR)
- [x] Selective Catalytic Reduction (SCR)
- [ ] Other (specify): ______

Section III - Operation Information

3.1. Describe the General Use of the equipment:
AUXILIARY BOILER TO AUGMENT TURBINE START.

3.2. Emission Data: (if unknown, leave blank)

STEADY STATE

Pollutants	Maximum Emissions before Control Device			Maximum Emissions after Control Device		
	gm / bhp	lb / hour	ppmv [1]	~~gm / bhp~~ lb/MMBTU	lb / hour	ppmv [1]
NMHC				.004	0.52	10
NOx				.0056	0.73	5
CO				.037	4.82	50
PM10				.007	0.91	—
SOx				.003	0.39	—

NOTE [1] - DRY, CORRECTED TO 3% O_2.

Source of Emission Data:

- [x] Attached Manufacturer Emission Data
- [ ] Attached Source Test Results
- [ ] Attached AP-42 Data
- [ ] Attached Other (specify) ______

3.3. District Rule 3.21 Compliance Options: Please circle one of the following options if you are subject to Rule 3.21.

If the equipment is rated greater than or equal to 1 MMBtu/hr and less than 5 MMBtu/hr:

A. Operate the equipment using less than 90,000 therms of annual heat input.
B. Operate in a manner that maintains stack gas oxygen concentration at less than or equal to 3% by volume.
C. Operate with a stack gas oxygen trim system set at 3% by volume oxygen.
D. Tune the unit at least once a year by a qualified technician in accordance with District Rule 3.21.
E. Operate in compliance with the emission limits specified in Rule 3.21-Table 1.

If the equipment is rated greater than or equal to 5 MMBtu/hr:

F. Operate the equipment using less than 90,000 therms of annual heat input AND Circle one additional compliance option between Section 3.3B-3.3E.
G. Operate in compliance with the emission limits specified in Rule 3.21-Table 1.

BOILERS, STEAM GENERATORS, AND PROCESS HEATERS SUPPLEMENTAL FORM

Section III - Operation Information

3.4. Operating Schedule: Q1 Q2 Q3 Q4 EACH

Maximum: 24 hours / day	2190 hours / qtr	8760 hours / year
Average: ____ hours / day	____ hours / qtr	____ hours / year

Section IV – Receptor Information

4.1. Description of Nearest Receptor (i.e. Residential Area, business, school, etc.): RESIDENCE

4.2. Facility Distance to the Nearest Receptor: ~3700 feet (TO NE AND/OR NW)

4.3. Name of Nearest School (K-12): BARRY ELEMENTARY

4.4. Facility Distance to the Nearest School: ~19800 feet (3.76 MILES TO NE)

If the facility is within 1,000 feet of a school site, and if the application will result in an increase in hazardous emissions, a public notice will be required at the expense of the applicant. (CH&S 42301.6)

Section V - Applicant Certification Statement

THE ABOVE INFORMATION IS SUBMITTED TO DESCRIBE THE DESIGN AND USE OF THE EQUIPMENT FOR WHICH APPLICATION FOR AUTHORITY TO CONSTRUCT IS BEING MADE.

SIGNATURE OF RESPONSIBLE OFFICIAL OF FIRM: Larry Sessions DATE: 2 / 21 / 13

TYPE OR PRINT NAME AND OFFICIAL TITLE OF PERSON SIGNING THIS DATA FORM

NAME: LARRY SESSIONS TITLE: PLANT MANAGER

APPLICATION / PERMIT BOILER Supplemental.doc, 6/7/2010

Appendix 3.2A
List of Threatened and Endangered Species, 2013

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 130116123230

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta lynchi

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

vernal pool tadpole shrimp (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)
Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
Critical habitat, winter-run chinook salmon (X) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Rana draytonii

California red-legged frog (T)

Reptiles

Thamnophis gigas

giant garter snake (T)

Plants

Pseudobahia bahiifolia

Hartweg's golden sunburst (E)

Candidate Species

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

NICOLAUS (529A)
SUTTER CAUSEWAY (529B)
KIRKVILLE (530A)
YUBA CITY (544A)
SUTTER (544B)
GILSIZER SLOUGH (544C)
OLIVEHURST (544D)
SUTTER BUTTES (545A)
TISDALE WEIR (545D)

County Lists

No county species lists requested.

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 16, 2013.

Sutter Energy Center Petition to Amend #6

Appendix 3.2A - California Native Plant Society Listed Plants

January 16, 2013

Scientific Name	Common Name	Family	Lifeform	Rare Plant Rank	State Rank	Global Rank	CESA	FESA	Elevation High (meters)	Elevation Low (meters)	CA Endemic
Pseudobahia bahiifolia	Hartweg's golden sunburst	Asteraceae	annual herb	1B.1	S2	G2	CE	FE	150	15	T

Appendix 3.2A - California Natural Diversity Database Sensitive Species Occurrences within 5 Miles

CNAME	SNAME	FEDLIST	CALLIST	GRANK	SRANK	RPLANTRANK	LOCATION	LOCDETAILS	ECOLOGICAL
bank swallow	Riparia riparia	None	Threatened	G5	S2S3		FEATHER RIVER MILE 21.5, LEFT BANK, ABOUT 4 MI SW OF OLIVEHURST.	MAPPED APPROXIMATELY TO PROVIDED TRS & RIVER MILE, & "0.5 MILES DUE WEST OF END OF BROADWAY SW OF OLIVEHURST."	NATURAL BANK CUT AND PARTIALLY VEGETATED; AGRICULTURAL FIELD ABOVE COLONY. THE LOWER 2.5 METER OF THE BANK WAS HEAVILY VEGETATED IN 1987.
bank swallow	Riparia riparia	None	Threatened	G5	S2S3		FEATHER RIVER MILE 20.7, RIGHT BANK, 0.8 MI NE OF OBANION RD AT GARDEN HWY, 7.2 MILES S OF THE YUBA CITY PO.	DURING 2010, THIS WAS A LARGE, FAIRLY CONTINUOUS COLONY WITH "3 MAIN CLUMPS." COLONIES 20.7 AND 20.8 MERGED INTO 1 COLONY DURING 2009 SURVEY.	HABITAT IS RIPARIAN SHRUB-SCRUB AT BANK AND RIPARIAN TREE OVER BANK. LARGE AREA OF BANK COLLAPSED LEAVING BURROWS EXPOSED AND EVIDENCE OF DEAD CHICKS DURING 2010.
cackling (=Aleutian Canada) goose	Branta hutchinsii leucopareia	Delisted	None	G5T4	S2		100 FT NORTH OF HUGHES ROAD AND WEST OF SCHLAG ROAD, EAST OF THE SUTTER BYPASS.		HABITAT CONSISTS OF A FALLOW (WINTER) RICE FIELD. BIRDS WERE FORAGING WITH WHITE-FRONTED GEESE (ABOUT 1,000) AND SNOW GEESE (2). SUTTER NATIONAL WILDLIFE REFUGE AND AGRICULTURE IN VICINITY.
California black rail	Laterallus jamaicensis coturniculus	None	Threatened	G4T1	S1		ABOUT 0.6 MI SOUTH OF OSWALD RD & WITHIN 0.5 MI OF BOULTON RD, JUST EAST OF THE SUTTER BYPASS WILDLIFE AREA.	"GO W ON OSWALD RD, S ON BOULTON RD, 0.6 MI S, R AT 1ST BRIDGE, AROUND ABANDONED SHACK, PROCEED ABOUT 200 FT...BIRD ON S SIDE OF RD, TOTAL OF 0.7 MI FROM OSWALD/BOULTON." NO ROAD/SHACK R OF BOULTON, BUT THERE IS TO L. MAPPED 0.5 MI TO R & L	ISOLATED & SPARCELY USED AGRICULTURE ROAD ADJACENT TO A RICE FIELD.
California linderiella	Linderiella occidentalis	None	None	G3	S2S3		SW OF THE INTERSECTION OF BEST ROAD AND TOWNSHIP ROAD, 2 MILES EAST OF SUTTER BYPASS		HABITAT CONSISTS OF SEASONAL WETLANDS AND DEPRESSIONS IN 10-YEAR FALLOW RICE FIELDS, VEGETATED WITH PHALARIS PARADOXA, RUMEX CRISPUS, SALIX SP, AND TYPHA SP. ENTIRE AREA IS DISKED ANNUALLY. BRANCHINECTA CYSTS FOUND IN 5 POOLS.
Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	None	None	G3	S2.1		GILSIZER SLOUGH, EAST OF SUTTER BYPASS, WEST OF HWY 113, SOUTHWEST OF YUBA CITY.	WILLOW-COTTONWOOD RIPARIAN OVER LEVEE TO W (IN BYPASS). BOUNDARY FROM NATIONAL WETLANDS INVENTORY INTERPRETATION OF 1977 AERIALS; NARROWS U/S PER NWI.	MARSH OF TYPHA SP & SCIRPUS ACUTUS. OPEN WATER CHANNEL IN CENTER.
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3		SUTTER BASIN, VICINITY OF EVERGLADE ROAD, ABOUT 1 MILE NORTH PELGAR ROAD, 6.5 MILES NORTH OF ROBBINS.		SLOW FLOWING WATER WITH SILT SUBSTRATE; BASKING IN SUNNY EXPANSES OF LOW GROWING EMERGENT AND STREAMSIDE VEGETATION; UPLAND RETREATS PRESENT, BUT LITTLE SHELTER PROVIDED FOR OVERWINTERING HABITAT.
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3				HABITAT CONSISTS OF AGRICULTURE, PREDOMINANTLY IN RICE PRODUCTION. AREA IS LINED WITH IRRIGATION CANALS THROUGHOUT; CANALS ARE ~12' WIDE AND 6'+ DEEP. BANKS ARE HEAVILY VEGETATED, WITH SOME DOWNED BRANCHES/LOGS WITHIN THE CHANNELS.
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3				DRAINAGE CANALS AND SLOUGH
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3				
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3				
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3				
giant garter snake	Thamnophis gigas	Threatened	Threatened	G2G3	S2S3		ALONG LEVEE ROAD, 1 MILE NORTH OF HUGHES ROAD, SUTTER BYPASS.	TOWNSHIP 14N RANGE 2E SECTION 5, SE 1/4 OF SE 1/4	HABITAT CONSISTS OF THE EDGE OF A AGRICULTURAL FIELD ON BYPASS LEVEE ROAD. AGRUCULTURAL LAND TO THE WEST, SUTTER BYPASS/SUTTER NATIONAL WILDLIFE REFUGE TO THE EAST.
Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	None	None	G2	S2.1		AROUND ABBOTT LAKE, WEST SIDE OF FEATHER RIVER, JUST U/S FROM STAR BEND OF FEATHER RIVER.	146.5 ACRES OF PRIME RIPARIAN VEG. AND A LAKE.	POPULUS W/SALIX GOODDINGII, CEPHALANTHUS, ALNUS, ACER NEGUNDO, GLEDITSIA TRIACANTHOS, CEPHALANTHUS OCCIDENTALIS, SAMBUCUS GLAUCA, QUERCUS LOBATA AND FRAXINUS OREGONA.
Hartweg's golden sunburst	Pseudobahia bahiifolia	Endangered	Endangered	G2	S2	1B.1	NEAR CORDUAS FARM.	CORDUAS FARM WAS A LARGE STOCK RANCH. ITS HEADQUARTERS WERE AT THE SITE WHICH GREW TO BECOME THE CITY OF MARYSVILLE ONCE THE GOLD RUSH BEGAN.	
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		WEST SIDE OF SUTTER BYPASS, JUST NORTH OF THE INTERSECTION OF CONDUIT ROAD, 0.5 MILE NORTH OF TISDALE BYPASS		NEST TREE WAS A WILLOW; SURROUNDED BY RIPARIAN TO THE NE, SE, AND SW.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		1.4 MILES EAST OF THE SACRAMENTO RIVER, ON THE NORTH SIDE OF TISDALE BYPASS, NEXT TO LEVEE ROAD.		
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		SACRAMENTO RIVER, ABOUT 0.75 MILE SOUTH OF STEINER BEND, BOTH EAST AND WEST OF CRANMORE.	DFG SWHA #SU004. NEST FOUND IN 1983 IN SEC 12 SW OF NW; IN 1984 IN SEC 7 NW (BOTH IN COLUSA CO). THIS PAIR COULD BE FROM DFG SWHA #CO008.	
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		EAST SIDE OF SUTTER BYPASS, 2.3 MILES NORTH OF THE JUNCTION WITH TISDALE BYPASS, 8 MILES EAST OF GRIMES		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NW AND SW, AND ROW CROPS TO THE NE AND SE.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		SOUTH SIDE OF TISDALE BYPASS, 7.5 MILES SE OF GRIMES		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NE AND SE, AND ROW CROPS TO THE NW AND SW.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		SOUTH SIDE OF TISDALE BYPASS, 8 MILES SE OF GRIMES		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NW AND SW, AND ROW CROPS TO THE NE AND SE.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		EAST SIDE OF SUTTER BYPASS, 0.3 MILE SOUTH OF HUGHES ROAD, 7.5 MILES SW OF YUBA CITY		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NW AND SW, AND ROW CROPS TO THE NE AND SE.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		WEST SIDE OF LEVEE ROAD, 1.4 MILES WEST OF BROADWAY ST JUNCTION WITH FEATHER RIVER BOULEVARD, 5 MILES SOUTH OF YUBA CITY		2002 & 2003 NEST TREE WAS A COTTONWOOD; SURROUNDED BY ORCHARDS TO THE NE & SE, & RIPARIAN TO THE NW & SW.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		WEST OF LEVEE ROAD, 1.4 MILES WNW OF BROADWAY ST JUNCTION WITH FEATHER RIVER BOULEVARD, 4.5 MILES SOUTH OF YUBA CITY		NEST TREE WAS A COTTONWOOD; SURROUNDED BY ORCHARDS TO THE NE AND SE, AND RIPARIAN TO THE NW AND SW.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		EAST SIDE OF THE FEATHER RIVER, NORTH OF ABBOTT LAKE, 4.5 MILES SOUTH OF YUBA CITY	2002 AND 2004 NEST TREES WERE COTTONWOODS.	NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NW AND SW, AND ORCHARDS TO THE NE AND SE.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		WEST SIDE OF THE FEATHER RIVER, 6 MILES SOUTH OF YUBA CITY. FEATHER RIVER WILDLIFE AREA.		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN IN ALL DIRECTIONS.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		SOUTH SIDE OF TISDALE BYPASS, 2.75 MILES EAST OF THE SACRAMENTO RIVER, 7 MILES SE OF GRIMES.		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN TO THE NW AND NE, AND ROW CROPS TO THE SW AND SE.
Swainson's hawk	Buteo swainsoni	None	Threatened	G5	S2		MIDDLE OF TISDALE BYPASS, 3.5 MILES EAST OF THE SACRAMENTO RIVER, 7.7 MILES SE OF GRIMES.		NEST TREE WAS A COTTONWOOD; SURROUNDED BY RIPARIAN IN ALL DIRECTIONS.
tricolored blackbird	Agelaius tricolor	None	None	G2G3	S2		GILSIZER SLOUGH, ON THE EAST SIDE OF SUTTER BYPASS, 9 MILES SSW OF YUBA CITY.	COLONY OCCUPIES APPROXIMATELY 60 ACRES.	NESTING SUBSTRATE CONSISTS OF TULES.
veiny monardella	Monardella venosa	None	None	G1	S1	1B.1	PLAIN OF THE FEATHER RIVER NEAR MARYSVILLE.	EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS AREA CENTERED ON MARYSVILLE.	
western pond turtle	Emys marmorata	None	None	G3G4	S3		EAST WATER CHANNEL OF SUTTER NWR, 100 FEET SOUTH OF HUGHES ROAD BRIDGE		HABITAT CONSISTS OF SLOW-MOVING WATER OF THE SUTTER BYPASS WATER CHANNEL.
woolly rose-mallow	Hibiscus lasiocarpos var. occidentalis	None	None	G4	S2.2	1B.2	ALONG THE WEST SIDE OF THE LEVEE THAT IS EAST OF THE SUTTER BYPASS.	WEST OF THE LEVEE FROM SECTION 9 SOUTH TO SECTION 35.	
woolly rose-mallow	Hibiscus lasiocarpos var. occidentalis	None	None	G4	S2.2	1B.2	NE EDGE OF SUTTER BYPASS FROM GILSIZER SLOUGH, SE FOR ABOUT 6 MILES TO PUMPING STATION.		
woolly rose-mallow	Hibiscus lasiocarpos var. occidentalis	None	None	G4	S2.2	1B.2	SUTTER BYPASS, EAST OF OSWALD, WEST END OF HUGHES ROAD.		
woolly rose-mallow	Hibiscus lasiocarpos var. occidentalis	None	None	G4	S2.2	1B.2	WESTERN EDGE OF SUTTER BYPASS CANAL, ABOUT 1 AIR MILE SOUTHEAST OF CONFLUENCE WITH WADSWORTH CANAL.	TWO INDIVIDUAL PLANTS APPROXIMATELY 8 FEET APART. MAPPED IN THE CENTER OF THE SW 1/4 OF SECTION 33 ACCORDING TO 2008 COORDINATES PROVIDED BY STUART.	COMMUNITY IS A MIXED RIPARIAN WITH POPULUS FREMONTII, PLATANUS RACEMOSA AND SALIX SP. AS DOMINANTS AND ROSA SP. AND VITIS CALIFORNICA AS SUBDOMINANTS. EASTERN ASPECT ON MODERATE SLOPE.

Sutter Energy Center Petition to Amend #6
Appendix 3.2A - California Natural Diversity Database Sensitive Species Occurrences within 5 Miles

CNAME	THREAT	GENERAL_	AREA	PERIMETER	AVLCODE	Symbology	Shape_Leng	Shape_Area
bank swallow		110 BURROWS ESTIMATED DURING SUMMER 1987 AERIAL SURVEY; 270 POST-BREEDING FLOCK OBSERVED.	281429.16300000000	1882.96500000000	20501	205	6177.16081445000	3028750.43781000000
bank swallow		COLONY 20.7 AND 20.8 ACTIVE ON 17 JUN 2008 WITH 368 BURROWS (AVE). COLONY 20.7 ACTIVE ON 10 JUN 2009 (129 BURROWS, AVE), AND 9 JUN 2010 (125-138 BURROWS). ADULTS WERE OBSERVED AT COLONY DURING 2009 AND 2010 (BANK COLLAPSE = DEAD CHICKS).	108385.84100000000	1606.83100000000	20201	202	5268.54811175000	1166452.52520000000
cackling (=Aleutian Canada) goose		100 ADULTS OBSERVED FORAGING AT DUSK ON 21 MAR 1997.	3141433.14800000000	6283.10600000000	20701	207	20612.08326120000	33808201.05350000000
California black rail		1 BLACK RAIL FLUSHED & CLEARLY SEEN BY RAY HASEY AT 5:12 PM ON 21 AUG 2006. ANOTHER BLACK RAIL OBS ABOUT 2 MI FROM HERE IN AUG 2001.	548118.50700000000	4122.12200000000	20301	203	13534.64493870000	5898870.36880000000
California linderiella	4 POOLS THREATENED BY A NEW ELECTRIC POWER PLANT PROPOSED FOR THE SITE.	>3000 INDIVIDUALS OBSERVED ON 24 JANUARY 1997; 20 RETAINED.	284234.39900000000	2456.90700000000	20301	203	8062.73415167000	3058937.74974000000
Coastal and Valley Freshwater Marsh	MINIMAL DISTURBANCE BY SOME OLD STRUCTURES & DEBRIS. SAFFLOWER & FALLOW FIELDS ADJACENT.	SEE WWW.DFG.CA.GOV/BIOGEODATA/VEGCAMP/NATURAL_COMM_BACKGROUND.ASP TO INTERPRET AND ADDRESS THE PRESENCE OF RARE COMMUNITIES.	534726.57400000000	8131.76000000000	30201	302	26676.90272290000	5754755.08517000000
giant garter snake	FLOOD CONTROL/WETLAND RECLAMATION; URBANIZATION; FLOODING; INTRODUCED PREDATORS; PEST CONTROL; POLLLUTION.	SNAKE OBSERVED AT SITE DURING 1986-87 STUDY. UNKNOWN NUMBER OF SNAKES OBSERVED DURING 1989.	282659.36400000000	1884.81600000000	20501	205	6183.25468339000	3041998.50434000000
giant garter snake	POSSIBLE THREAT FROM AG EQUIPMENT/ACTIVITIES.		150132209.06400000000	49398.33800000000	99901	999	151938.54819800000	1525574444.54000000000
giant garter snake			300528269.94600000000	77203.07900000000	99901	999	162924.35133200000	1784041264.30000000000
giant garter snake			150132209.06400000000	49398.33800000000	99901	999	151938.54819800000	1525574444.54000000000
giant garter snake			150132209.06400000000	49398.33800000000	99901	999	151938.54819800000	1525574444.54000000000
giant garter snake			150132209.06400000000	49398.33800000000	99901	999	151938.54819800000	1525574444.54000000000
giant garter snake	THREATS INCLUDE AGRICULTURAL PRACTICES AND LEVEE ROAD.	1 ADULT OBSERVED ON 22 AUGUST 2005.	70602.60300000000	942.20000000000	20401	204	3090.94121258000	759827.33881100000
Great Valley Cottonwood Riparian Forest	AREA USED FOR HUNTING, FISHING.	ACQUIRED BY DFG IN 1985 AS ER; MGMT PLAN EMPHASIS IS PRESERVATION OF INTERIOR WETLANDS & RIPARIAN HABITAT. SEE WWW.DFG.CA.GOV/BIOGEODATA/VEGCAMP/NATURAL_COMM_BACKGROUND.ASP TO INTERPRET AND ADDRESS THE PRESENCE OF RARE COMMUNITIES.	956093.16500000000	5896.16700000000	30201	302	7613.59959591000	2773912.61250000000
Hartweg's golden sunburst	NEARLY ENTIRE AREA HAS BEEN CONVERTED TO RESIDENTIAL, INDUSTRIAL, OR AGRICULTURAL USES. OCCURRENCE PRESUMED EXTIRPATED.	TYPE LOCALITY. OCCURRENCE KNOWN ONLY FROM AN 1847 HARTWEG COLLECTION FROM VICINITY OF CORDUAS FARM. PORTIONS OF THIS AREA WERE SEARCHED BY STEBBINS IN 1990 BUT NO SUITABLE HABITAT WAS FOUND.	201051722.15800000000	50264.84400000000	11002	810	63005.69304750000	184118999.09900000000
Swainson's hawk		DFG SWHA #SU014. 2 LIGHT-PHASE ADULTS OBSERVED SOARING; NO NEST FOUND. ADULT ACTIVITY CENTERED AROUND A WILLOW ON 18 MAY 2002; ADULT FLEW INTO THE NEST TREE WITH A MOUSE ON 24 JUN 2002; ADULTS OBSERVED WITH 1 FEATHERED CHICK ON 26 JUL 2002.	20023.32500000000	502.13600000000	20101	201	1647.28770365000	215491.81286800000
Swainson's hawk		DFG SWHA #SU013. 2 ADULTS OBSERVED AND NEST FOUND; 3 FLEDGLINGS LATER OBSERVED FLYING WITH ADULTS.	281446.01000000000	1883.02100000000	20501	205	6177.34734739000	3028933.36037000000
Swainson's hawk		ADULTS OBSERVED PERCHED IN COTTONWOODS ALONG THE RIVER IN 1979 AND 1982. ACTIVE NEST SITE IN 1983 AND 1984.	8005489.58700000000	10042.72500000000	20901	209	11266.38888060000	3426403.18033000000
Swainson's hawk		ADULTS OBSERVED CARRYING STICKS TO PRESUMED NEST TREE ON 19 APR 2003; 1 ADULT SEEN PERCHED IN TREE ADJACENT TO PRESUMED NEST TREE ON 19 JUN 2003; 1 FLEDGLING OBSERVED BRANCHING ON 22 JUL 2003.	20023.32500000000	502.13600000000	20101	201	1647.28714570000	215491.68427500000
Swainson's hawk		ADULTS OBSERVED SITTING IN THE NEST TREE, WITH THE NEST BEHIND THEM, ON 19 APR 2003; 2-3 SMALL, DOWNY CHICKS OBSERVED ON 19 JUN 2003; 2 FLEDGLINGS OBSERVED FLYING AND PERCHING NEAR THE NEST ON 22 JUL 2003.	20023.32500000000	502.13600000000	20101	201	1647.28783994000	215491.84449700000
Swainson's hawk		ADULT OBSERVED FLYING INTO THE NEST TREE ON 19 APR 2003; ADULT ON NEST ON 19 JUN 2003; 1 FLEDGLING OBSERVED PERCHING IN A NEARBY TREE ON 22 JUL 2003.	20023.32500000000	502.13600000000	20101	201	1647.28795890000	215491.87591300000
Swainson's hawk		ADULT CARRYING FOOD INTO THE SUSPECTED NEST TREE ON 19 JUN 2003; 2 FLEDGLINGS PERCHED IN NEST TREE ON 22 JUL 2003.	20023.32500000000	502.13600000000	20101	201	1647.28700536000	215491.64551100000
Swainson's hawk		POSSIBLE NEST ACTIVITY OBSERVED ON 22 MAY 2002; 1 JUVENILE OBSERVED WITH ADULTS ON 18 JUN AND 14 JUL 2002. NEST DISCOVERED ON 4 MAY 2003; 1 FLEDGLING OBSERVED PERCHED IN THE NEST TREE ON 9 JUL 2003.	35832.94100000000	699.83600000000	20201	202	2264.58286954000	371365.78391900000
Swainson's hawk		NEST TREE DISCOVERED ON 4 MAY 2003; 2 FLEDGLINGS OBSERVED PERCHED NEAR THE NEST ON 9 JUL 2003.	20023.32500000000	502.13600000000	20101	201	1617.81098622000	201389.96043100000
Swainson's hawk		NEST FOUND ON 25 APR 2002; HEADS OF 2 CHICKS VISIBLE ON 22 MAY 2002; YOUNG FLEDGED BY 14 JUL 2002. 2 ADULTS OBSERVED (NO NEST FOUND) ON 26 MAY 2004; ADULT OBSERVED FEEDING 2 RECENTLY-FLEDGED YOUNG ON 2 JUL 2004.	29850.45300000000	625.09400000000	20201	202	733.66435895200	16195.27895980000
Swainson's hawk		ADULT OBSERVED SOARING AND DIVING ON A TURKEY VULTURE ON 7 JUL 2004, THEN NEST WITH 1 YOUNG WAS DISCOVERED.	20023.32500000000	502.13600000000	20101	201	1647.28764635000	215491.79081800000
Swainson's hawk		NEST FOUND ON 11 APR 2002; ADULT OBSERVED WITH 1 DOWNY CHICK ON 18 MAY 2002; FEATHERED CHICK OBSERVED ON 24 JUN 2002.	20023.32500000000	502.13600000000	20101	201	1647.28804300000	215491.89771400000
Swainson's hawk		ADULTS OBSERVED FLYING WITH NEST MATERIAL ON 11 APR 2002; ADULT OBSERVED FLYING FROM TREES, BUT NEST NOT VISIBLE; 2 FEATHERED JUVENILES OBSERVED WITH 1 ADULT IN AN ADJACENT FIELD ON 26 JUL 2002.	20023.32500000000	502.13600000000	20101	201	1647.28793444000	215491.86966000000
tricolored blackbird	POSSIBLE THREAT OF DRAINAGE FOR FLOOD CONTROL. MARSH BURNED IN 1988 AND 1989. PESTICIDE SPRAYED ON ADJACENT FIELDS.	30,000 OBSERVED NESTING ON 12 JUN 1974. 10,000 OBSERVED NESTING IN 1987. 1500 OBSERVED NESTING ON 30 JUN 1992. SITE CHECKED ON 23 APR 1994; NO BIRDS PRESENT (POSSIBLY CHECKED TOO EARLY).	281440.53600000000	1883.00300000000	20501	205	6177.29135640000	3028878.42989000000
veiny monardella		ONLY SOURCE OF INFO FOR THIS LOCATION IS AN 1854 COLLECTION BY BIGELOW. NEEDS FIELDWORK.	201051722.15800000000	50264.84400000000	11002	810	63005.69304750000	184118999.09900000000
western pond turtle	POSSIBLE THREAT FROM COUNTY-PROPOSED BRIDGE REPLACEMENT PROJECT.	1 ADULT OBSERVED SUNNING ON AN EMERGENT LOG ON 9 MAY 1997.	20105.07700000000	502.70100000000	20101	201	1649.13773413000	216371.45698600000
woolly rose-mallow		50+ PLANTS OBSERVED ALONG THE WESTERN MARGIN OF REFUGE TRACT 11 IN 1988. INCLUDES FORMER OCCURRENCE #111.	1359553.65900000000	17246.37700000000	10301	103	56524.86816120000	14631565.96460000000
woolly rose-mallow		OBSERVED IN 1984.	1609635.01200000000	20425.93000000000	10201	102	24702.20425810000	6163686.58002000000
woolly rose-mallow	IN AREA WHERE BRIDGE REPAIR WORK WAS IN PROGRESS. MAY HAVE DESTROYED SEVERAL PLANTS.	ONLY 1 FLOWERING PLANT SEEN IN 1987. SPECIES EXTANT IN 1997 (CROWE).	281442.46500000000	1883.00900000000	10501	105	6177.30554853000	3028892.37095000000
woolly rose-mallow	WESTERN EDGE OF CANAL RECEIVES LITTLE DISTURBANCE.	2 PLANTS OBSERVED IN 2008.	20023.32500000000	502.13600000000	10101	101	1647.28699763000	215491.65558600000

Appendix 3.2B
Generator Tie-Line Wetland Delineation Report

Preliminary Delineation of Wetlands and Other Water Bodies

for the

Sutter Linears Enhancement Project, Sutter County, California

October 2012

ICF International

Preliminary Delineation of Wetlands and Other Water Bodies

for the

Sutter Linears Enhancement Project, Sutter County, California

Prepared for:

Calpine Construction Finance Company, L.P.

4160 Dublin Boulevard, Suite 100

Dublin, CA 94568-7755

Contact: Ms. Barbara McBride, Western Regional Director, Environmental Health and Safety

Work Phone: 925.557.2238

Cell Phone: 925.570.0849

Email: Barbara.McBride@Calpine.com

Prepared by:

ICF International

630 K Street, Suite 400

Sacramento, CA 95814

Contact: Sue Bushnell

916.752.0959

October 2012

ICF International. 2012. Preliminary Delineation of Wetlands and Other Water Bodies for the Sutter Linears Enhancement Project, Sutter County, California. October. (ICF 00775.10) Sacramento, CA. Prepared for Calpine Construction Finance Company, L.P.

Contents

Tables and Figures

Tables **Page**

Figures **Follows Page**

Acronyms and Abbreviations

Arid West Supplement	Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region Version 2.0
CCFC	Calpine Construction Finance Company, L.P.
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
GPS	global positioning system
JD	jurisdictional determination
OHWM	ordinary high water mark
PG&E	Pacific Gas and Electric Company
SEC	Sutter Energy Center
USGS	U.S. Geological Survey

Preliminary Delineation of Wetlands and Other Water Bodies for the Sutter Linears Enhancement Project, Sutter County

Introduction

This report presents the results of a delineation of wetlands and other water bodies conducted for Calpine Construction Finance Company, L.P.'s (CCFC's) Sutter Linears Enhancement Project in Sutter County, California (Figure 1).

The proposed project involves a new 230-kV interconnection to Pacific Gas and Electric Company's (PG&E's) Table Mt.–Tesla 500-kV transmission line. As part of the proposed project, CCFC would construct a new 500-kV substation on 35 acres of rice fields within a 160-acre property and a 230-kV generation tie line (gen-tie) from the Sutter Energy Center (SEC) to the new substation. As shown in Figure 2, two alternative routes have been identified; one route for the 230-kV gen-tie follows an existing county road and the other route follows farm roads at the property lines. The northern route extends about 1.75 miles from the SEC to the new proposed substation site and the southern route extends approximately 1.81 miles from the SEC to the new proposed substation site.

The delineation was conducted to assist CCFC in determining the type and extent of wetlands and other water bodies in the delineation area that may be waters of the United States and subject to regulation by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act (CWA). Wetlands and other water bodies were delineated using the routine onsite determination method described in the U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and, where applicable, the criteria specified in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region Version 2.0 (Arid West Supplement) (U.S. Army Corps of Engineers 2008). Additionally, in evaluating the potential jurisdictional status of cultivated rice fields, the guidance presented in Sacramento District Regulatory Branch memorandum 2007-01 (Irrigated Wetlands) (U.S. Army Corps of Engineers 2007) and verbal guidance from the Corps Sacramento District on delineations for previous rice land projects was considered. The verbal guidance from Brian Vierria of the Corps pertained to projects in which the applicant was requesting a "preliminary" jurisdictional determination (JD) from the Corps, rather than an "approved" JD. For the previous project delineations, Mr. Vierria directed ICF International staff to assume that the rice fields would revert to wetland conditions in the absence of irrigation water and therefore should be mapped as wetlands, rather than non-wetlands.

The delineation of wetlands and other water bodies was based primarily on field survey data collected in October 2010 and on interpretation of aerial photographs taken in 2010.

The delineation area encompasses 503.9 acres and includes areas that could be directly or indirectly disturbed during construction and maintenance of the project. The delineation area along the gen-tie alignment extends 500 feet from both sides of each gen-tie alignment, with the exception of the

Sutter Energy Center and the Sutter National Wildlife Refuge (described below). Also included in the delineation area is a 160-acre parcel within which the 35-acre substation would be constructed.

Based on the data collected during the field surveys and from aerial photograph interpretation, the delineation area contains 459.49 acres of wetlands and other water bodies (Table 1).

Table 1. Acreage Summary of Wetlands and Other Water Bodies

Feature	Acreage
Wetland Drainage (WD)	3.24
Rice Field Wetland (RFW)	448.70
Other Waters Drainage (OWD)	7.55
Total	**459.49**

A description of the wetland and other water body features mapped in the delineation area is provided in the *Results* section of this report, and their locations are depicted in the 1" = 400' aerial photographs contained in Appendix A. All jurisdictional boundaries presented in Appendix A are preliminary and subject to verification by the Corps Sacramento District.

Project Applicant

The project applicant is Calpine Construction Finance Company, L.P. The contact person for the project applicant is as follows:

Calpine Construction Finance Company, L.P.
4160 Dublin Boulevard, Suite 100
Dublin, CA 94568-7755

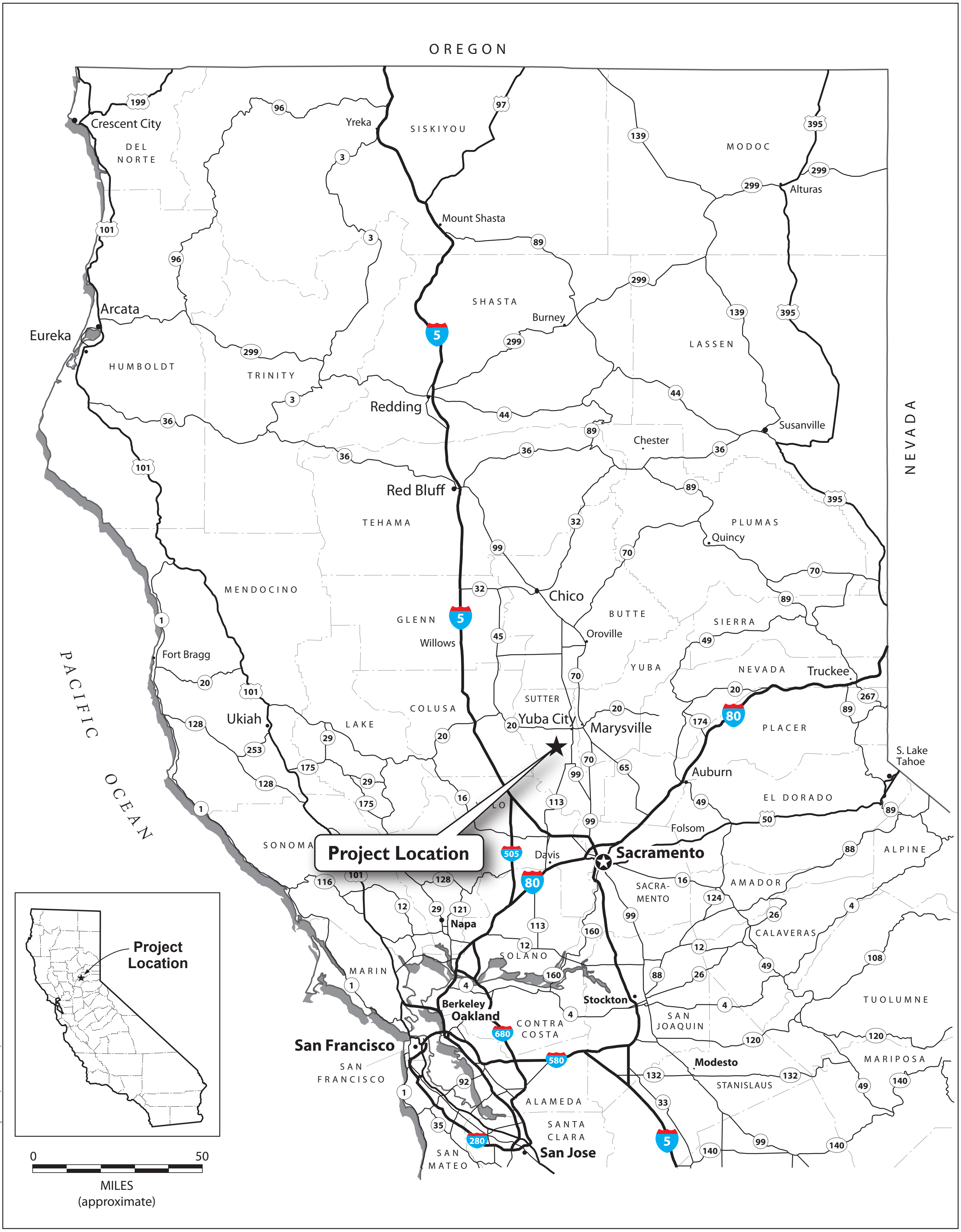
Contact: Ms. Barbara McBride, Western Regional Director,
Environmental Health and Safety
Work Phone: 925.557.2238
Cell Phone: 925.570.0849
Email: Barbara.McBride@Calpine.com

The delineation area is owned by multiple property owners. CCFC will be obtaining easements through these properties to construct and operate the project facilities.

Site Location and Driving Directions

The project area is located in central Sutter County. The eastern end of the delineation area is located at the Sutter Energy Center, approximately 4.5 miles southwest of Yuba City. The western end is located approximately 2,700 feet east of the Sutter Bypass. Figure 1 shows the location of the delineation area and its relationship to the surrounding towns, roads, and the Sutter Bypass.

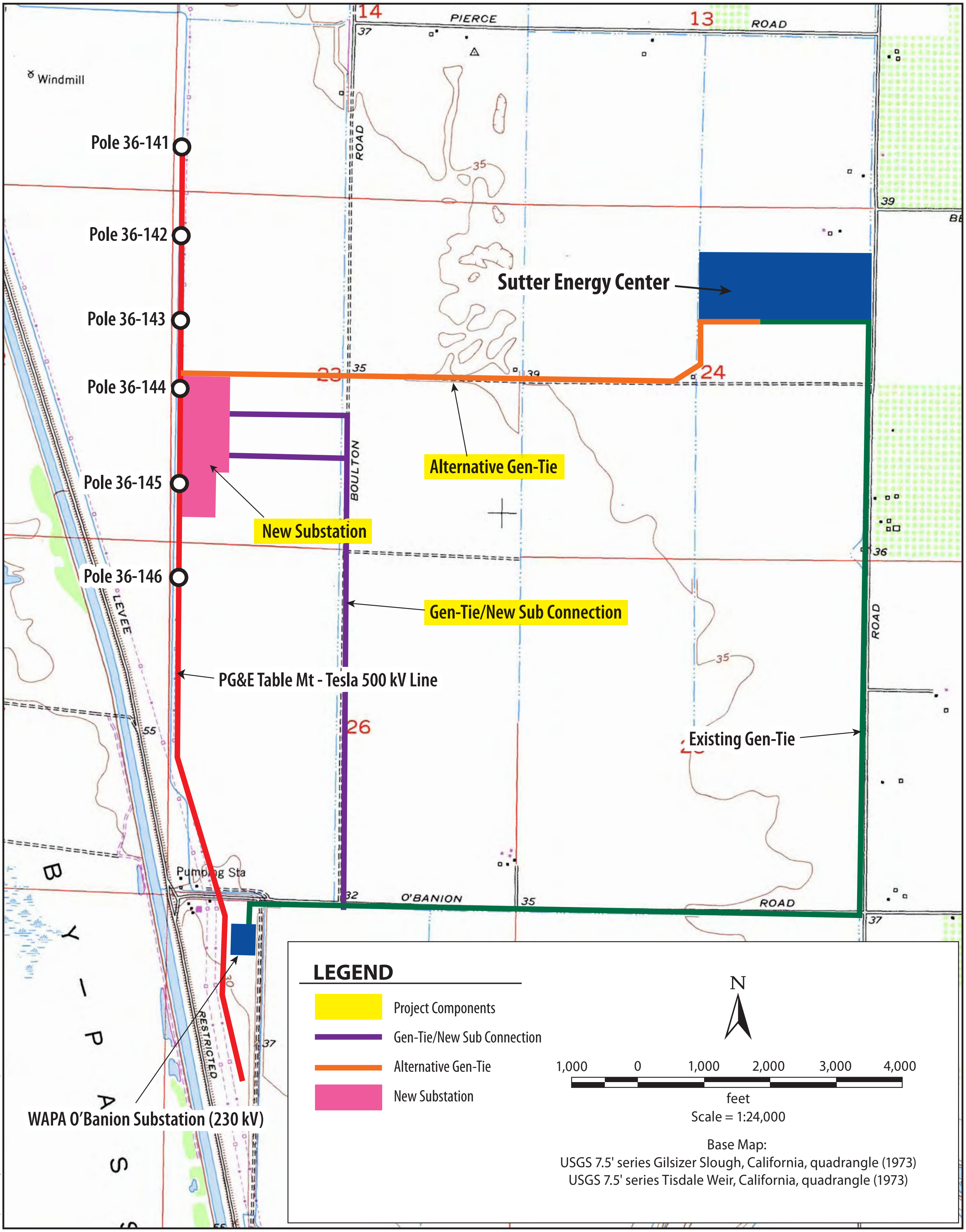
The delineation area is located on the Gilsizer Slough U.S. Geological Survey (USGS) 7.5-minute quadrangle. The eastern end of the delineation area is at 39.05070° north latitude and 121.69648° west longitude and the western end is at 39.05264° north latitude and 121.72683° longitude.



00775.10 Cult Report (1-2011)

INTERNATIONAL

Figure 1
Regional Location



Graphics\Projects\00775.10 Bio Report (9-2011)JD

ICF INTERNATIONAL

Figure 2
Sutter Linears Enhancement Project

To reach the eastern end of the delineation area, from downtown Sacramento, go north on Interstate 5. After six miles, take the state Highway 99/70 north exit. Proceed approximately 14 miles and take the left fork for Highway 99. Continue north on Highway 99 approximately 13 miles and turn left onto Hutchinson Road. Continue approximately 1.5 miles on Hutchinson Road, then turn right onto South George Washington Blvd. Continue approximately one-half mile and turn left onto Best Road. Continue approximately one-half mile to the Sutter Energy Center, located near the intersection of Best Road and South Township Road.

Site Description

Land Use

The entire delineation area is used for rice production. It has been farmed for many decades and now does not support any natural habitat. Although some fields are periodically fallowed, no evidence of the fields being rotated to other crops was observed during the delineation field survey and a preliminary site visit on September 3, 2010.

The area is used for waterfowl and deer recreational hunting during the fall and winter months. The Sutter National Wildlife Refuge occurs west of the delineation area.

Topography

Elevations in the delineation area are approximately 39 feet at the eastern end and 35 feet at the western end. Slopes are generally zero to one percent.

The delineation area is generally used for rice farming. However, some of the fields appear to have been leveled and therefore have parallel checks; the unleveled fields have contour checks.

Hydrology

General. The delineation area is located in the Lower Feather hydrologic unit (HUC 18020106) (U.S. Geological Survey 2010).

The delineation area appears to drain southerly via several ditches to a pumping plant located at the western end of O'Banion Road, adjacent to the east levee of the Sutter Bypass. The pumping plant appears to pump the tailwater into a channel located along the western side of the bypass.

The Feather River is located approximately five miles east of the eastern end of the delineation area and is a navigable water of the United States (U.S. Army Corps of Engineers 2010).

Irrigation water is applied to the rice fields in the delineation area using a conventional flow through irrigation system, in which water is delivered from a canal into the top paddy of the overall field then flows through several paddies to the bottom field. Checks and weir boxes placed at the ends of each levee control water flow rates and water depth in the individual fields.

The rice fields are flooded up to a depth of approximately six inches in April and then usually aerially seeded. Until harvest time in September or October, the fields are maintained in a flooded condition. After being harvested in the fall, some of the rice fields are flooded again in the winter months to attract waterfowl and/or to promote the decay of the rice stubble.

Soils

A map of the soils in the delineation area and associated hydric soil information are provided in Appendix B. The landform and hydrologic characteristics of the soils are summarized in Table 2. Morphologically, the soils that formed on a terrace (i.e., Gridley and Tisdale series) are moderately deep over siltstone and have a clay loam to clay texture. The soils that formed in basin landforms (i.e., Oswald and Subaco series) are moderately deep over siltstone and have a clay texture.

Precipitation and Growing Season

The climate in the delineation area is characterized by hot, dry summers and cool, moist winters. National Weather Service cooperative weather station number CA6194 (Nicolas 2) is the closest weather station to the delineation area, located approximately 12 miles to the southeast. Mean annual precipitation at the Nicolas 2 station is 19.57 inches. Most of the precipitation falls as rain between October and April (U.S. Department of Agriculture, Natural Resources Conservation Service 2007).

No significant rain had fallen between the end of the 2009-2010 rainy season and the time of the delineation field survey on November 2, 2010. For the 2009-2010 rainy season, the region had received roughly 100% of the mean annual precipitation, according to National Weather Service information.

The average length of the growing season in the central part of Sutter County is inferred to be approximately 275 days (Lytle 1988).

Vegetation

The delineation area is within the Sacramento Valley geographic subdivision of the Great Central Valley in the California Floristic Province (University of California, Berkley 2012). The delineation area was historically perhaps an open grassland community in the eastern part and emergent and/or seasonal wetlands in the western part.

The entire delineation area now consists of active or fallow rice fields and does not support any natural habitat.

A list of the plant species that were observed while conducting the delineation field surveys and their wetland indicator status is provided in Appendix C. The wetland plant communities found in the delineation area are described in the *Results* section of this report.

Delineation Methods

The fieldwork for the delineation was conducted by a soil and wetland specialist on November 2, 2010. The investigator used the routine onsite determination method described in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and, where applicable, the criteria specified in the Arid West Supplement (U.S. Army Corps of Engineers 2008). This report has been prepared in accordance with the Corps, Sacramento District guidelines for preliminary wetland delineations (U.S. Army Corps of Engineers 2001).

As detailed in the Arid West Supplement, data on vegetation, soil, and hydrology characteristics used as the basis for wetland boundary determinations were collected and recorded on Arid West

Table 2. Summary of Geomorphic Surface and Hydrologic Characteristics of the Soils in the Delineation Area

Soil Map Symbol	Soil Map Unit Name	Geomorphic Surface	Natural Drainage Class	Existing Drainage Class	Permeability (slowest layer)	Existing Flooding Frequency*	Existing Seasonal High Water Table* (feet) Type of Water Table	Hydric Status of Primary Component of Map Unit**
132	Gridley clay loam, 0 to 1 percent slopes	terraces and basin rims	well	well	slow	none	>6.0 n/a	non-hydric
153	Oswald clay, 0 to 2 percent slopes	basin floors	poor	(improved)	slow	rare	1.5-3.5 perched	hydric
173	Subuco clay, 0 to 2 percent slopes	basin floors	poor	(improved)	slow	rare	1.5-3.0 perched	hydric
174	Tisdale clay loam	low terraces	well	well	moderately slow	none	>6.0 n/a	non-hydric

Sources: Soil Survey Staff 2010, Lytle 1980.

* Water table refers to a saturated zone in the soil. The figures represent the depth to the top (upper limit) of the seasonal saturated zone in most years. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence (namely, redoximorphic features), of a saturated zone in the soil.

** "Primary Component" refers to the soil that makes up approximately 85% or more of the map unit. The remaining soils in the map unit (i.e., inclusions) are not indicated here. The inclusions may or may not be hydric.

Supplement data forms (version 2.0) where access was available at the time of the field survey (Appendix D). Data forms were completed at six sample plots (data points).

In areas where the field investigator did not have access because of landowner restrictions or rice harvesting activities, wetlands and other water bodies were mapped from the interpretation of aerial photographs; these features were viewed from adjacent areas wherever possible. The aerial photograph interpretation was based on known reference areas in which site access was available.

The plant indicator status of each species is based on *North American Digital Flora: National Wetland Plant List, Version 2.4.0, Arid West Region* (Lichvar and Kartesz 2009). Common and scientific plant names are taken from the second edition of *The Jepson Manual: Vascular Plants of California* (University of California Press 2012) and online updates (University of California, Berkeley 2012).

The boundaries of non-wetland water bodies (i.e., other waters drainages) were delineated at the ordinary high water mark (OHWM), as defined in Title 33, section 328.3 of the Code of Federal Regulations (CFR). The OHWM represents the limit of potential Corps jurisdiction over nontidal waters (e.g., irrigation ditches, canals, and natural streams) in the absence of adjacent wetlands (*33 CFR 328.04*). The features were mapped and delineated in the field in accordance with Corps Regulatory Guidance Letter No. 05-05 (U.S. Army Corps of Engineers 2005).

A Trimble GeoXT global positioning system (GPS) unit, typically accurate to less than one horizontal meter, was used to record the location of the delineation sample plots (i.e., data points). Because the boundaries of wetland and other water bodies were clearly evident on the 1 inch = 300 feet aerial photograph base map used in the field survey, the features were mapped directly onto the aerial photograph. The GPS data were downloaded, differentially corrected, and superimposed onto recent color orthorectified aerial photographs and edited as necessary. This data was combined with the digitized aerial photograph-interpreted data to generate the delineation maps.

Results

Table 3 provides the total acreage of wetlands and other water bodies located in the delineation area.

Table 3. Acreage Summary of Wetlands and Other Water Bodies

Feature	Status	Acreage
Wetland Drainage (WD)	Wetland	3.24
Rice Field Wetland (RFW)	Wetland	448.70
Wetlands Subtotal		***451.94***
Other Waters Drainage (OWD)	Other Waters	7.55
Other Water Bodies Subtotal		**7.55**
Total		**459.49**

Photographs of representative wetlands, other water bodies, and of the delineation area in general are provided in Appendix E.

Wetlands

Wetland Drainage

A number of wetland drainages totaling 3.24 acres were mapped within the delineation area (Appendix A). Wetland drainages consist of agricultural drainage ditches and canals that are more than 5% vegetated; most are at least 50% vegetated. Paired data points were taken at representative wetland drainages to confirm the presence of all three wetland indicators (hydrophytic vegetation, hydric soil, and wetland hydrology) used by the Corps to identify wetlands.

The wetland drainages are typically dominated by either by broadleaf cattail (*Typha latifolia*) (OBL) or Dallis grass (*Paspalum dilatatum*) (FAC). The typical associate species in the cattail type is common tule (*Schoenoplectus acutus*) (OBL). Common associate species in the Dallis grass type are umbrella sedge (*Cyperus eragrostis*) (FACW) and Bermuda grass (*Cynodon dactylon*) (FACU). Hydric soil was identified by the presence of the indicator Hydrogen Sulfide Odor (A4)[1]. Wetland hydrology was identified by the presence of Surface Water (A1) and Hydrogen Sulfide Odor (A4).

The wetland drainages have a well-defined bed and bank and have been excavated to depths of approximately three to six feet. They appear to be supported by one or more of the following: irrigation tailwater from rice fields, high groundwater, and runoff from rice fields when they are fallow. At least some of the drainages appear to be subject to periodic dredging, such that much or all of the vegetation is removed. All wetland drainages eventually flow to the Sutter Bypass.

Rice Field Wetland

Rice field wetlands totaling 448.70 acres were mapped in the delineation area. This includes all rice fields that are currently under cultivation and those that were fallow at the time of the delineation field survey.

The rice field wetlands consist of large, leveled or contour-checked fields. They are fully vegetated while rice is being produced and partly vegetated by volunteer species when fallow. Data points were established at three locations in the rice field in which the new substation is proposed to confirm the presence of all three wetland indicators (hydrophytic vegetation, hydric soil, and wetland hydrology) used by the Corps to identify wetlands.

Rice field wetlands consist of a near monoculture of cultivated rice (*Oryza sativa*) (OBL) when rice is being produced. Common associate species, typically occurring only along the edges of the rice fields where the water depth is slightly shallower, include Dallis grass. The single fallow rice field was observed to be dominated by dock-leaf smartweed (*Persicaria lapathifolia*) (FACW) and Canadian horseweed (*Conyza canadensis* var. *canadensis*) (FACU). Hydric soil was identified at all three data points by the presence of the indicator Redox Dark Surface (F6). Wetland hydrology was identified at all three data points by the presence of Oxidized Rhizospheres Along Living Roots (C3).

The rice field wetlands appear to be supported by flood irrigation, incident precipitation, and possibly by a shallow water table.

[1] It is assumed that the soil in the wetland drainage did not show redox features because it is subject to periodic excavation as a result of maintenance dredging, which would tend to obliterate or prevent the formation of significant redox features.

Other Water Bodies

Other Waters Drainage

Many other waters drainages were mapped in the delineation area, comprising approximately 7.55 acres, and would qualify as other waters (Appendix A). These features mainly consist of irrigation canals that are less than 5% vegetated. The remaining other waters drainages are drainage ditches.

The other waters drainages have been excavated to depths of approximately four to eight feet. The other waters drainages appear to be supported by one or more of the following: irrigation water delivered directly to the feature, tailwater from rice fields, groundwater, and runoff from rice fields when they are fallow. Nearly all of the drainages appear to be subject to periodic dredging, such that much or all of the vegetation is removed. All other waters drainages eventually flow to the Sutter Bypass.

References Cited

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* (Technical Report Y-87-1.) Vicksburg, MS: U.S. Army Waterways Experiment Station.

Lichvar, R.W. and J. T. Kartesz. 2009. North American Digital Flora: National Wetland Plant List, version 2.4.0 (https://wetland_plants.usace.army.mil), Arid West Region. U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC. Effective June 1, 2012. Accessed: September 24, 2012.

Lytle, D.J. 1988. Soil Survey of Sutter County, California. U.S. Department of Agriculture, Soil Conservation Service in cooperation with Regents of the University of California (Agricultural Experiment Station). Washington, DC: U.S. Government Printing Office.

Soil Survey Staff. 2010. Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed October 17, 2010.

University of California, Berkeley. 2012. *Jepson Online Interchange California Floristics* (Web application). University Herbarium and the Jepson Herbarium. Available: <http://ucjeps.berkeley.edu/interchange.html>. Accessed: October 1, 2012.

University of California, Berkeley. 2012. *The Jepson Manual: Vascular Plants of California*. Second Edition. University of California Press, Berkeley.

U.S. Geological Survey. 2010. Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units. Last revised: April 23, 2010. Available: http://water.usgs.gov/wsc/cat/18020106.html. Accessed: October 17, 2010.

U.S. Army Corps of Engineers. 2001. Minimum Standards for Acceptance of Preliminary Wetlands Delineations. Sacramento, CA. Last updated: November 30. Available: http://www.spk.usace.army.mil//organizations/cespk-co/regulatory/pdf/min_standards.pdf. Accessed: October 17, 2010.

———. 2005. *Ordinary High Water Mark Identification.* (Regulatory Guidance Letter No. 05-05). December 7, 2005.

———. 2007. *Irrigated wetlands*. Sacramento District Regulatory Branch Memorandum 2007-01. Dated March 13, 2007.

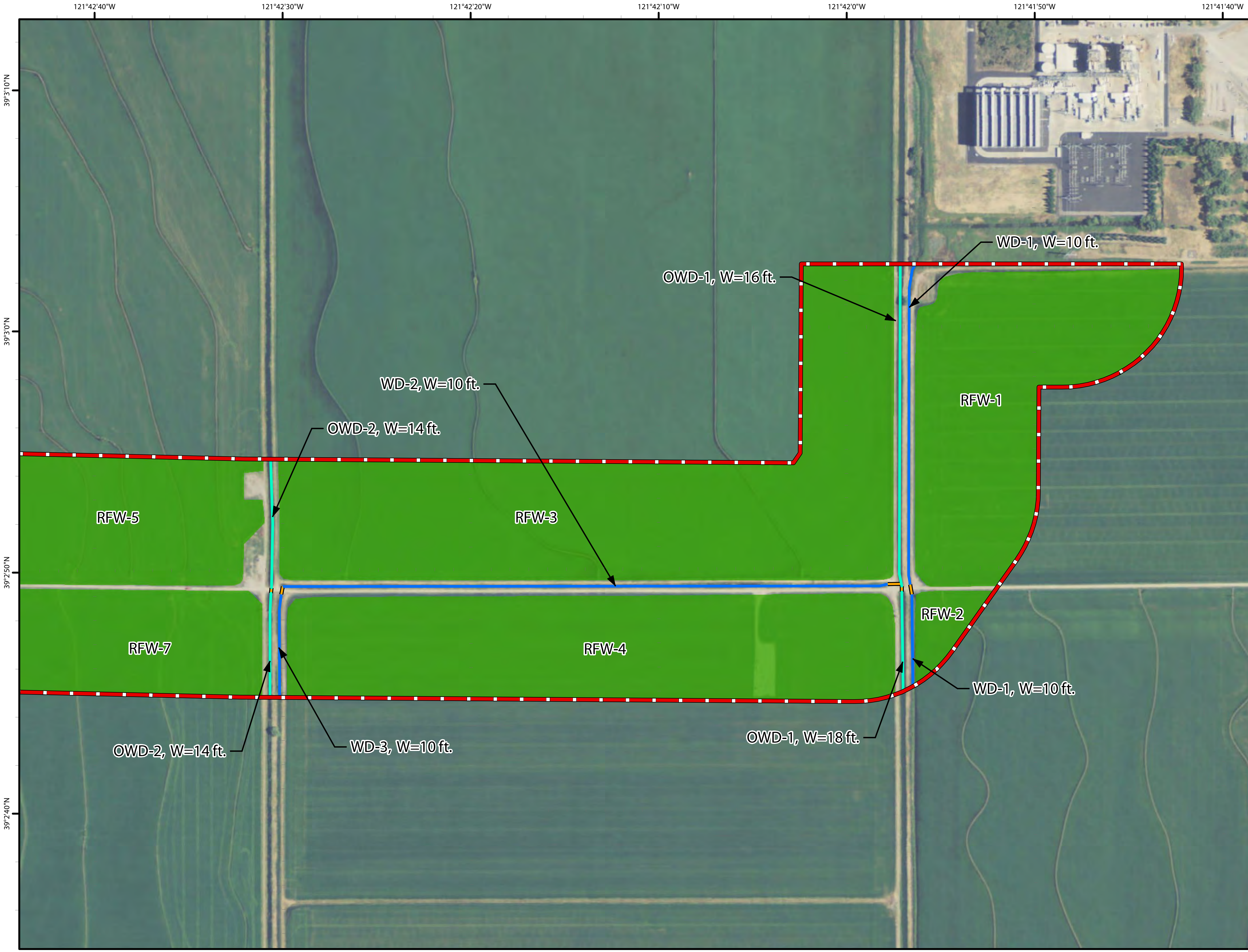
———. 2008. *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Arid West Region (Version 2.0)*. J. S. Wakeley, R. W. Lichvar, and C.V. Noble (eds.). (ERDC/EL TR-08-28.) Vicksburg, MS: U.S. Army Engineer Research and Development Center.

———. 2010. Navigable Waterways in the Sacramento District. Available: http://www.spk.usace.army.mil//organizations/cespk-co/regulatory/waterways.html. Accessed: October 17, 2010.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2007. WETS Table documentation for the Nicolas 2 cooperative weather station (station CA 6194), California. Available: http://www.wcc.nrcs.usda.gov/ftpref/support/climate/wetlands/ca/06101.txt. Accessed: January 28, 2011. Last Updated: August 29, 2002.

Appendix A

Preliminary Delineation of Wetlands and Other Water Bodies



Appendix A
Preliminary Delineation of Wetlands and Other Water Bodies
Sutter Linears Enhancement Project
October 2012
Sheet 1 of 4

Legend

Wetland Delineation Boundary (507.9 Acres)

Data Point

Culvert

Wetlands

Rice Field Wetland (RFW) (448.70 Acres)

Other Waters

Wetland Drainage (WD) (3.24 Acres)

Other Waters Drainage (OWD) (7.55 Acres)

W = Average width

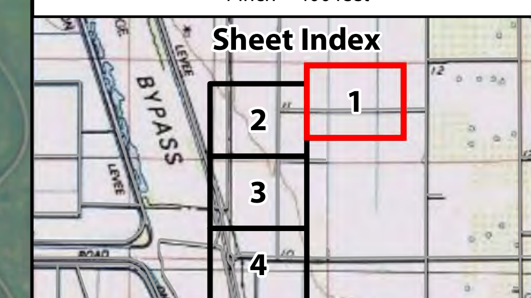
N

0 100 200 400

Feet

1 inch = 400 feet

Sheet Index



1. Base map Source: ICF 2011
2. Aerial Source: NAIP 2012
3. USGS Topo Quad: Gilsizer Slough
4. PLSS: T. 14 N, R. 2 E

Delineated By: Joel Butterworth	Nov 2010
Drawn By: Alex Angier	Oct 2012

ICF INTERNATIONAL

K:\PROJECTS_1\CALPINE\00775_10_SUTTER\MAPDOC\WETLAND_DELINEATION\WETLAND_20110216.MXD ME (02-16-11)

Appendix A
Preliminary Delineation of Wetlands and Other Water Bodies
Sutter Linears Enhancement Project
October 2012
Sheet 2 of 4

Legend

Wetland Delineation Boundary (507.9 Acres)

Data Point

Culvert

Wetlands

Rice Field Wetland (RFW) (448.70 Acres)

Other Waters

Wetland Drainage (WD) (3.24 Acres)

Other Waters Drainage (OWD) (7.55 Acres)

W = Average width

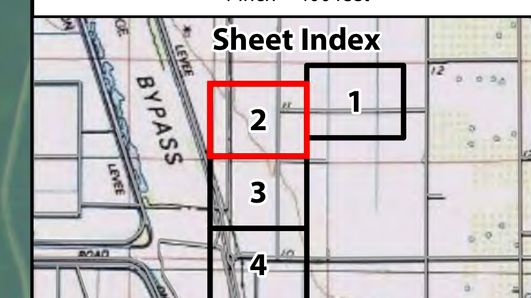
N

0 100 200 400

Feet

1 inch = 400 feet

Sheet Index



1. Base map Source: ICF 2011
2. Aerial Source: NAIP 2012
3. USGS Topo Quad: Gilsizer Slough
4. PLSS: T. 14 N, R. 2 E

Delineated By: Joel Butterworth	Nov 2010
Drawn By: Alex Angier	Oct 2012

ICF INTERNATIONAL

K:\PROJECTS_1\CALPINE\00775_10_SUTTER\MAPDOC\WETLAND_DELINEATION\WETLAND_20110216.MXD ME (02-16-11)

Appendix A
Preliminary Delineation of Wetlands and Other Water Bodies
Sutter Linears Enhancement Project
October 2012
Sheet 3 of 4

Legend

Wetland Delineation Boundary (507.9 Acres)

Data Point

Culvert

Wetlands

Rice Field Wetland (RFW) (448.70 Acres)

Other Waters

Wetland Drainage (WD) (3.24 Acres)

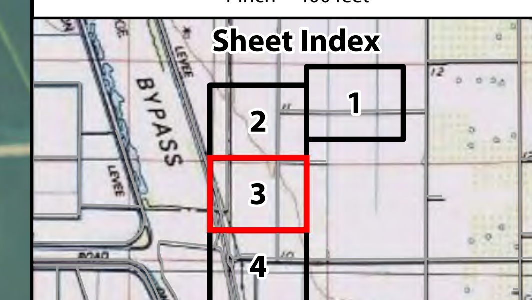
Other Waters Drainage (OWD) (7.55 Acres)

W = Average width

0 100 200 400

Feet

1 inch = 400 feet



1. Base map Source: ICF 2011
2. Aerial Source: NAIP 2012
3. USGS Topo Quad: Gilsizer Slough
4. PLSS: T. 14 N, R. 2 E

Delineated By: Joel Butterworth	Nov 2010
Drawn By: Alex Angier	Oct 2012

ICF INTERNATIONAL

K:\PROJECTS_1\CALPINE\00775_10_SUTTER\MAPDOC\WETLAND_DELINEATION\WETLAND_20110216.MXD ME (02-16-11)

Appendix A
Preliminary Delineation of Wetlands and Other Water Bodies
Sutter Linears Enhancement Project
October 2012
Sheet 4 of 4

Legend

- Wetland Delineation Boundary (507.9 Acres)
- Data Point
- Culvert

Wetlands

- Rice Field Wetland (RFW) (448.70 Acres)

Other Waters

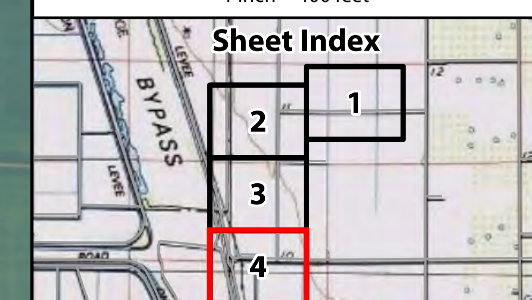
- Wetland Drainage (WD) (3.24 Acres)
- Other Waters Drainage (OWD) (7.55 Acres)

W = Average width

N

0 100 200 400
Feet
1 inch = 400 feet

Sheet Index



1. Base map Source: ICF 2011
2. Aerial Source: NAIP 2012
3. USGS Topo Quad: Gilsizer Slough
4. PLSS: T. 14 N, R. 2 E

Delineated By: Joel Butterworth	Nov 2010
Drawn By: Alex Angier	Oct 2012

ICF INTERNATIONAL

K:\PROJECTS_1\CALPINE\00775_10_SUTTER\MAPDOC\WETLAND_DELINEATION\WETLAND_20110216.MXD ME (02-16-11)

Appendix B
Soil Survey Information

Hydric Soils (CA)

This table lists the map unit components and their hydric status in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2B3). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
   B. are poorly drained or very poorly drained and have either:
      i. a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
      ii. a water table at a depth of 0.5 foot or less during the growing season if saturated hydraulic conductivity (Ksat) is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
      iii. a water table at a depth of 1.0 foot or less during the growing season if saturated hydraulic conductivity (Ksat) is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

Hydric Condition: Food Security Act information regarding the ability to grow a commodity crop without removing woody vegetation or manipulating hydrology.

References:
Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
Federal Register. September 18, 2002. Hydric soils of the United States.
Federal Register. July 13, 1994. Changes in hydric soils of the United States.
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
National Research Council. 1995. Wetlands: Characteristics and boundaries.
Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.
Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.
Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.
Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

Report—Hydric Soils (CA)

Hydric Soils (CA)– CA101 - Sutter County, California							
Map symbol and map unit name	**Component/ Local Phase**	**Hydric status**	**Landform**	**Hydric criteria met (code)**	**Farmable condition**	**Comp. pct.**	**Altered hydrology notes**
132: Gridley clay loam, 0 to 1 percent slopes	(C) - Gridley-	No	Terraces	—	—	80	—
	(I) - Capay-	No	—	—	—	0-4	—
	(I) - Conejo-	No	—	—	—	0-4	—
	(I) - Liveoak-	No	—	—	—	0-3	—
	(I) - Marcum-	No	—	—	—	0-3	—
	(I) - Oswald-	Yes	Basin floors	2B3,4	Neither wooded nor farmable under natural conditions	0-3	—
	(I) - Tisdale-	No	—	—	—	0-3	—
153: Oswald clay, 0 to 2 percent slopes	(C) - Oswald-clay	Yes	Basin floors	2B3,4	Neither wooded nor farmable under natural conditions	90	—
	(I) - Conejo-	No	—	—	—	0-4	—
	(I) - Gridley-	No	—	—	—	0-3	—
	(I) - Tisdale-	No	—	—	—	0-3	—
173: Subaco clay, 0 to 2 percent slopes	(C) - Subaco-clay	Yes	Basin floors	2B3,4	Neither wooded nor farmable under natural conditions	80	—
	(I) - Capay-	Yes	Basin floors	4	Farmable under natural conditions	0-7	—
	(I) - Clear Lake-	Yes	Basin floors	2B3,4	Neither wooded nor farmable under natural conditions	0-7	—
	(I) - Oswald-	Yes	Basin floors	2B3,4	Neither wooded nor farmable under natural conditions	0-6	—
174: Tisdale clay loam, 0 to 2 percent slopes	(C) - Tisdale-	No	Terraces	—	—	75	—
	(I) - Oswald-	Yes	Flood plains	2B3,4	Neither wooded nor farmable under natural conditions	0-5	—
	(I) - Conejo-	No	—	—	—	0-5	—
	(I) - Gridley-	No	—	—	—	0-5	—

Hydric Soils (CA)– CA101 - Sutter County, California							
Map symbol and map unit name	**Component/ Local Phase**	**Hydric status**	**Landform**	**Hydric criteria met (code)**	**Farmable condition**	**Comp. pct.**	**Altered hydrology notes**
	(I) - Liveoak-	No	—	—	—	0-5	—
	(I) - Unnamed W/ Hardpan-	—	—	—	—	0-5	—

Data Source Information

Soil Survey Area: Sutter County, California
Survey Area Data: Version 7, Aug 31, 2009

Soil Map—Sutter County, California
(Soil Survey Map)

Map Scale: 1:25,100 if printed on A size (8.5" x 11") sheet.

Meters
0 300 600 1,200 1,800

Feet
0 1,000 2,000 4,000 6,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:25,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sutter County, California
Survey Area Data: Version 7, Aug 31, 2009

Date(s) aerial images were photographed: 9/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Sutter County, California (CA101)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
132	Gridley clay loam, 0 to 1 percent slopes	42.9	8.5%
153	Oswald clay, 0 to 2 percent slopes	404.9	79.9%
173	Subaco clay, 0 to 2 percent slopes	35.0	6.9%
174	Tisdale clay loam, 0 to 2 percent slopes	24.0	4.7%
Totals for Area of Interest		**506.8**	**100.0%**

Appendix C

Plant Species Observed in the Delineation Area

Appendix C
Plant Species Observed in the Delineation Area

The * following a scientific name indicates that the species is not native. Wetland indicator status follows the 2012 National Wetland Plant List, Arid West; nomenclature follows Lichvar and Kartesz.(2009), *The Jepson Manual, Second Edition* (2012), and online updates.

Scientific Name	Common Name	Wetland Indicator Status‡
Trees		
Juglans hindsii	Northern California black walnut	FAC
Salix gooddingii	Goodding's black willow	FACW
Shrubs and Woody Vines		
Rubus armeniacus [*R. discolor*] *	Himalayan blackberry	FACU
Vitis californica	California grape	FACU
Forbs		
Brassica nigra *	black mustard	UPL
Centaurea solstitialis *	yellow star-thistle	UPL
Cichorium intybus *	chickory	FACU
Cirsium vulgare *	bull thistle	FACU
Convolvulus arvensis *	field bindweed	UPL
Conyza canadensis var. *canadensis*	Canadian horseweed	FACU
*Geranium dissectum**	cut-leaf geranium	UPL
Helminthotheca echioides [Picris echioides] *	bristly ox-tongue	FACU
Hirschfeldia incana *	Mediterranean hoary mustard	UPL
Lactuca serriola *	prickly lettuce	FACU
Malvella leprosa	alkali mallow	FACU
Persicaria lapathifolia [Polygonum lapathifolium]	Dock-leaf smartweed	FACW
Plantago lanceolata *	English plantain	FAC
Rumex crispus *	curly dock	FAC
Silybum marianum *	milk thistle	UPL
Sonchus asper ssp. *asper* *	prickly sowthistle	FAC
Vicia sativa *	common vetch	FACU
Xanthium strumarium	cockle-bur	FAC
Grasses and Grass-like Plants		
Avena barbata *	slender wild oat	UPL
*Cynodon dactylon**	Bermuda grass	FACU
Cyperus eragrostis	umbrella sedge	FACW
Distichlis spicata	saltgrass	FAC
Hordeum murinum ssp. *leporinum* *	wall barley	FACU
Leymus triticoides (Elymus triticoides in Jepson 2012*)*	creeping wild rye	FAC
Lolium perenne [L. multiflorum] (Festuca perennis in Jepson 2012*)**	Perennial rye grass	FAC
Oryza sativa *	cultivated rice	OBL

Scientific Name	Common Name	Wetland Indicator Status‡
Paspalum dilatatum *	dallis grass	FAC
Phalaris aquatica *	bulbous canarygrass, Harding grass	FACU
*Poa annua**	annual bluegrass	FACU
Schoenoplectus acutus [*Scirpus acutus* var. *occidentalis*]	common tule	OBL
Sorghum halepense *	Johnsongrass	FACU
Typha latifolia	broadleaf cattail	OBL

‡ Wetland Indicator Status for Arid West:

OBL (obligate)—almost always occurs in wetlands (99% probability of occurrence in wetlands).

FACW (facultative wetland)—usually occurs in wetlands (67–99% probability).

FAC (facultative)—equally likely to occur in wetlands or nonwetlands (34–66% probability).

FACU (facultative upland)—usually occurs in nonwetlands but occasionally occurs in wetlands (1–33% probability).

UPL (obligate upland)—almost never occurs in wetlands (1% probability); in general, species that are not listed on the wetland plant list are assumed to be obligate upland species.

Appendix D
Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 1

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ______

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation x*, Soil X**, or Hydrology x*** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	**Is the Sampled Area within a Wetland?**	Yes x No ___
Hydric Soil Present?	Yes x No ___		
Wetland Hydrology Present?	Yes x No ___		

Remarks:
* Field has been seeded with rice and rice in process of being harvested. ** Field was leveled in last 3 years. *** Field is subject to flood irrigation.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Oryza sativa	100	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 100

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- x Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-6	10YR3/1	85	7.5YR4/6	13	C	M	c	Ap horizon
				2	C	PL		
6-21	10YR3/4	75	7.5YR3/3	25	C	PF*	c	A horizon. Redox on ped faces (PF).

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
x Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ________
Depth (inches): ________

Hydric Soil Present? Yes x No ____

Remarks:

Clay to surface. *PF under Redox Feature Location = ped face.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
x Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
x Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Thin Muck Surface (C7)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No x Depth (inches): n/a
Water Table Present? Yes ____ No x Depth (inches): none to 21
Saturation Present? (includes capillary fringe) Yes ____ No x Depth (inches): none to 21

Wetland Hydrology Present? Yes x No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 2

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ____

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation x*, Soil X**, or Hydrology x*** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	**Is the Sampled Area within a Wetland?** Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks:

* Field has been seeded with rice and rice in process of being harvested at immediate data point. ** Field was leveled in last 3 years. *** Field is subject to flood irrigation.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Oryza sativa	100	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

x Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-8	10YR3/1	92	5YR4/6	8	C	M	c-	Ap horizon. Oxidized rhizospheres.
8-19	10YR3/1	80	7.5YR3/3	20	C	PF	c	A horizon.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- _x_ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes _x_ No ___

Remarks:

Clay to surface. *PF in Redox Feature Location = ped face.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- _x_ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No _x_	Depth (inches): n/a
Water Table Present?	Yes ___	No _x_	Depth (inches): none to 19
Saturation Present? (includes capillary fringe)	Yes ___	No _x_	Depth (inches): none to 19

Wetland Hydrology Present? Yes _x_ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 3

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): convex Slope (%): 3

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ______

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation x*, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ______, Soil x**, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No x	**Is the Sampled Area within a Wetland?**	Yes ___ No x
Hydric Soil Present?	Yes ___ No x		
Wetland Hydrology Present?	Yes ___ No x		

Remarks:

Data point located at levee hinge point. * Levee vegetation is mown. ** Soil is fill material.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft)			
1. Centaurea solstitialis	65	Y	NL
2. Lactuca serriola	20	Y	FAC
3. Lolium multiflorum	15	N	FAC
4. Picris echiodes	5	N	FACW
5.			
6.			
7.			
8.			
= Total Cover	105		
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ___ No x

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-18	10YR3/1	85	10YR4/4	15	C	M	c	Fill material

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ____ No x

Remarks:

Redox assumed to have formed in source area for fill material for levee and does not reflect hydrology of existing site.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No x Depth (inches): n/a

Water Table Present? Yes ______ No x Depth (inches): none to 18

Saturation Present? (includes capillary fringe) Yes ______ No x Depth (inches): none to 18

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 4

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): convex Slope (%): 3

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ____

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation x*, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ____, Soil x**, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No x	**Is the Sampled Area within a Wetland?**	Yes ____ No x
Hydric Soil Present?	Yes ____ No x		
Wetland Hydrology Present?	Yes ____ No x		

Remarks:
Data point located at levee hinge point. * Levee vegetation is mown. ** Soil is fill material.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Sorghum halepense	65	Y	FACU
2. Hirshfeldia incana	25	Y	NL
3. Cynodon dactylon	5	N	FAC
4.			
5.			
6.			
7.			
8.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No x

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-21	10YR3/2	100					cl*	Fill material

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ____ No x

Remarks:

* With clods of hard clay.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No x Depth (inches): n/a

Water Table Present? Yes ______ No x Depth (inches): none to 21

Saturation Present? (includes capillary fringe) Yes ______ No x Depth (inches): none to 21

Wetland Hydrology Present? Yes ____ No x

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 5

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ____

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation x**, Soil x*, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	**Is the Sampled Area within a Wetland?** Yes x No ___
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks:

Data point located in ditch, at toe of levee slope. * and ** Soil and vegetation in ditch appears to be routinely dredged, possibly precluding formation of redox features

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Scirpus acutus	25	Y	OBL
2. Cynodon dactylon	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	25	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

x Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-3	10YR3/2	100					cl	C1 horizon
3-13	10YR2/1	100					cl	C2 horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- x Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- x Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes x No ___

Remarks:

Native profile has been truncated from ditch excavation. Faint H2S odor. * Soil in ditch appears to be routinely dredged, possibly precluding formation of redox features

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- x Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- x Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes x No ___ Depth (inches): 4

Water Table Present? Yes ___ No ___ Depth (inches): n/a

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): n/a

Wetland Hydrology Present? Yes x No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Faint H2S odor.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Calpine 230kV Sutter Transmission Line Interconnect Project City/County: Sutter County Sampling Date: Nov. 2, 2010

Applicant/Owner: Calpine Pipeline Company State: CA Sampling Point: 6

Investigator(s): Butterworth Section, Township, Range: 23 & 24, T14N, R2E

Landform (hillslope, terrace, etc.): basin floor Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR): C Lat: 39.05108 N Long: 121.70835 W Datum: ____

Soil Map Unit Name: Oswald clay, 0 to 2 percent slopes (#153) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation x**, Soil x*, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x	No	**Is the Sampled Area within a Wetland?**	Yes x No
Hydric Soil Present?	Yes x	No		
Wetland Hydrology Present?	Yes x	No		

Remarks:

* Field has been seeded with rice and rice in process of being harvested. ** Field was leveled in last 3 years. *** Field is subject to flood irrigation.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Oryza sativa	100	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

x Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes x No ___

Remarks:

Rice has been cut but not harvested.

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Horizon and Remarks
0-7	10YR3/2	85	5YR4/6	15	C	PL&RC	c	A1 horizon
7-14	10YR3/2	90	7.5YR4/4	10	C	M	c	A2 horizon
14-19	10YR3/2	100					c	C horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- _x_ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes _x_ No ___

Remarks:

* RC under Redox Feature Location = root channel/oxidized rhizospheres. According to landowner, this part of the field was cut by about 6 inches as part of leveling operation, so soil profile partly truncated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- _x_ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- _x_ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No _x_	Depth (inches): n/a
Water Table Present?	Yes ___	No _x_	Depth (inches): none to 19
Saturation Present? (includes capillary fringe)	Yes ___	No _x_	Depth (inches): none to 19

Wetland Hydrology Present? Yes _x_ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Faint H2S odor.

Appendix E
Representative Photographs

Appendix E
Representative Photographs

Photo 1. Overview of delineation area, facing northeast from Boulton Road. Rice field wetland in foreground and middleground. Sutter Energy Center in right-background.

Photo 2. Rice field wetland undergoing harvest. Facing north from southeastern corner of field containing proposed substation. Sharpshooter is at Data Point 6.

Photo 3. Fallow rice field wetland along western side of Boulton Road, facing north-northwest. Field is dominated by dock-leaf smartweed and Canadian horseweed.

Photo 4. Dallis grass-dominated wetland drainage along eastern side of northern extension of Boulton Road, looking south.

Photo 5. Broadleaf cattail-dominated wetland drainage along northern edge of delineation area, facing west.

Photo 6. Other waters drainage (irrigation canal) along western side of Boulton Road, facing north.

Appendix 3.3A
CHRIS Record Search Results
(filed separately under a request for confidentiality)

APPENDIX 3.3A

CHRIS Record Search Results

This appendix has been filed separately under a request for confidentiality.

Appendix 3.3B
Native American Consultation

Sacred Lands File & Native American Contacts List Request

NATIVE AMERICAN HERITAGE COMMISSION
915 Capitol Mall, RM 364
Sacramento, CA 95814
(916) 653-4082
(916) 657-5390 – Fax
nahc@pacbell.net

Information Below is Required for a Sacred Lands File Search

Project:____ Sutter Energy Project___________________________________

County___Sutter____

USGS Quadrangle

Name_ Gilsizer Slough, California___________________________________

Township _____ Range _______ Section(s) _________

14N 2E, Sections 22, 23, and 24 and 14N 3E, Sections 18 and 19

Company/Firm/Agency:

CH2MHILL____

Contact Person: ___Natalie Lawson________________________________

Street Address: _6 Hutton Centre Drive, Suite 700_____________________

City: ____Santa Ana__________________________________Zip:___92707_____________

Phone: ___714-628-9666__________________________

Fax: _____714-424-2246__________________________

Email: __nlawson@ch2m.com____

Project Description: Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical grid.

STATE OF CALIFORNIA Edmund G. Brown, Jr., Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390

January 18, 2013

Natalie Lawson
CH2M HILL
6 Hutton Centre Drive, Ste 700
Santa Ana, CA 92707

Sent by Fax 714-424-2246

Number of Pages 2

RE: #Sutter Energy Project, Gilsizer Slough, Sutter county

Dear Ms. Lawson:

A search of the Native American Heritage Commission (NAHC) *Sacred Lands File* was completed for the area of potential project effect (APE) referenced above. Please note that the absence of specific site information in the *Sacred Lands File* does not indicate the absence of Native American traditional cultural places or cultural landscapes in any APE. While in this case, a search of the NAHC *Sacred Lands File* did not indicate the presence of any sites within the APE you provided, a Native American tribe or individual may be the only source for the presence of traditional cultural places. For that reason, enclosed is a list of Native American individuals/organizations who may have knowledge of traditional cultural places in your project area. This list should provide a starting place in locating any areas of potential adverse impact.

The NAHC makes no recommendation or preference of any single individual, or group over another. All of those on the list should be contacted, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe or group. If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: rw_nahc@pacbell.net

Sincerely,

Katy Sanchez for

Rob Wood
Associate Government Program Analyst

Native American Contact List
Sutter County
January 18, 2012

Mechoopda Indian Tribe of Chico Rancheria
Dennis E. Ramirez, Chairperson
125 Mission Ranch Blvd — Mechoopda Maidu
Chico , CA 95926 — Concow
dramirez@mechoopda-nsn.gov
(530) 899-8922 ext 215
(530) 899-8517 - Fax

United Auburn Indian Community of the Auburn Rancheria
Marcos Guerrero, Tribal Preservation Committee
10720 Indian Hill Road — Maidu
Auburn , CA 95603 — Miwok
mguerrero@auburnrancheria.com
530-883-2364
530-883-2320 - Fax

United Auburn Indian Community of the Auburn Rancheria
David Keyser, Chairperson
10720 Indian Hill Road — Maidu
Auburn , CA 95603 — Miwok
530-883-2390
530-883-2380 - Fax

Mechoopda Indian Tribe of Chico Rancheria
Mike DeSpain, Director - OEPP
125 Mission Ranch Blvd — Mechoopda Maidu
Chico , CA 95926 — Concow
mdespain@mechoopda-nsn.gov
(530) 899-8922 ext 219
(530) 899-8517 - Fax

Strawberry Valley Rancheria
Cathy Bishop, Chairperson
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
catfrmsac2@yahoo.com
916-501-2482

United Auburn Indian Community of the Auburn Rancheria
Danny Rey, THPO
10720 Indian Hill Road — Maidu
Auburn , CA 95603 — Miwok
dannyr@auburnrancheria.com
916-368-9742 - cell
530-883-2390
530-888-5476 - Fax

Enterprise Rancheria of Maidu Indians
Art Angle, Vice Chairperson
2133 Monta Vista Avenue — Maidu
Oroville , CA 95966
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
2133 Monta Vista Ave — Maidu
Oroville , CA 95966
info@enterpriserancheria.com
(530) 532-9214
(530) 532-1768 FAX

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Sutter Energy Project, Gilsizer Slough USGS Quadrangle, Sutter County

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

Enterprise Rancheria of Maidu Indians
Art Angle, Vice Chairperson
2133 Monta Vista Avenue
Oroville, California 95966
eranch@cncnet.com

Re: Sutter Energy Center, Petition to Amend

Dear Mr. Angle:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

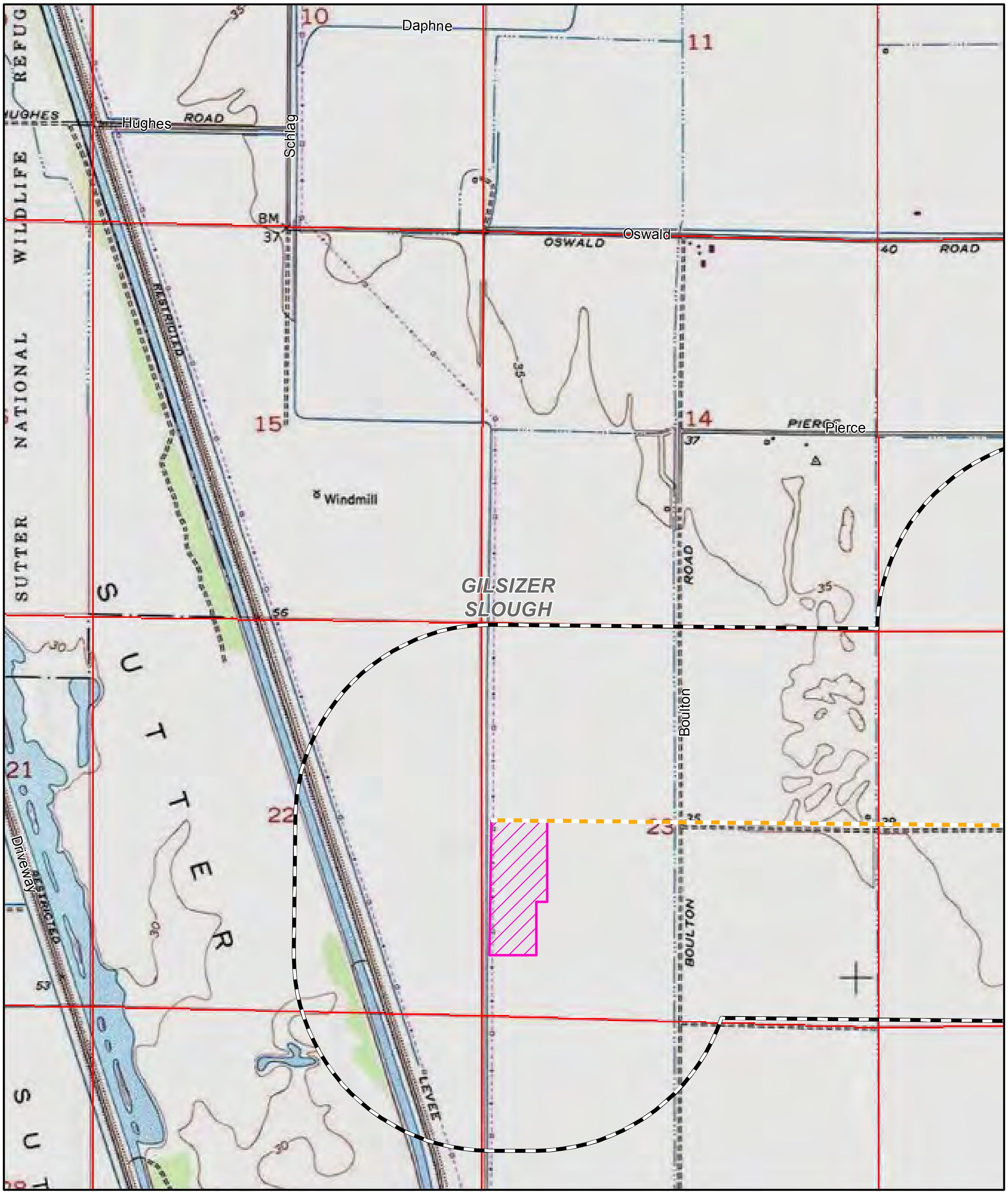
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

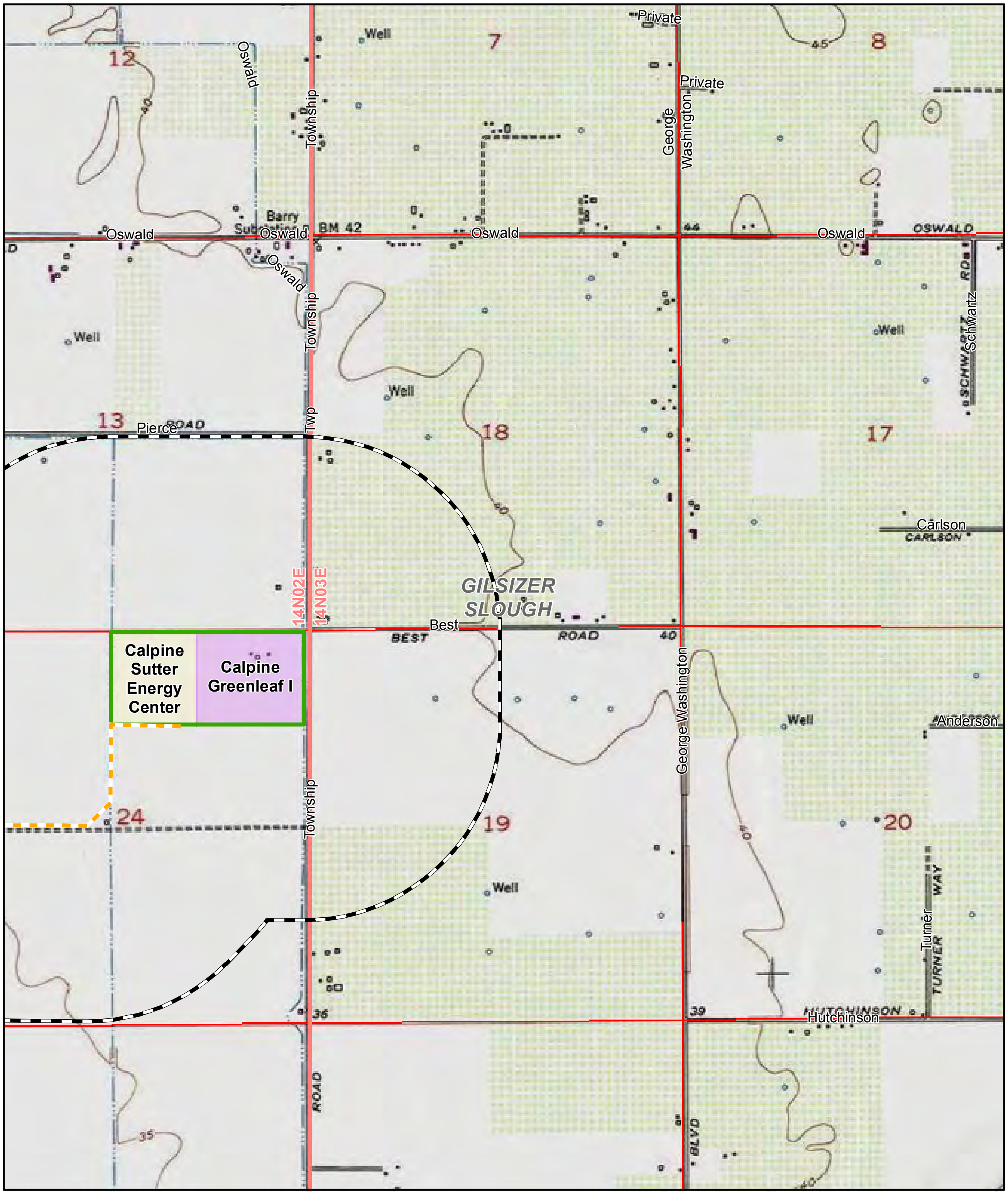
- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

CH2MHILL

February 4, 2013

Strawberry Valley Rancheria
Cathy Bishop, Chairperson
PO Box 667
Marysville, California 95901
Catfrmsac2@yahoo.com

Re: Sutter Energy Center, Petition to Amend

Dear Ms. Bishop:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

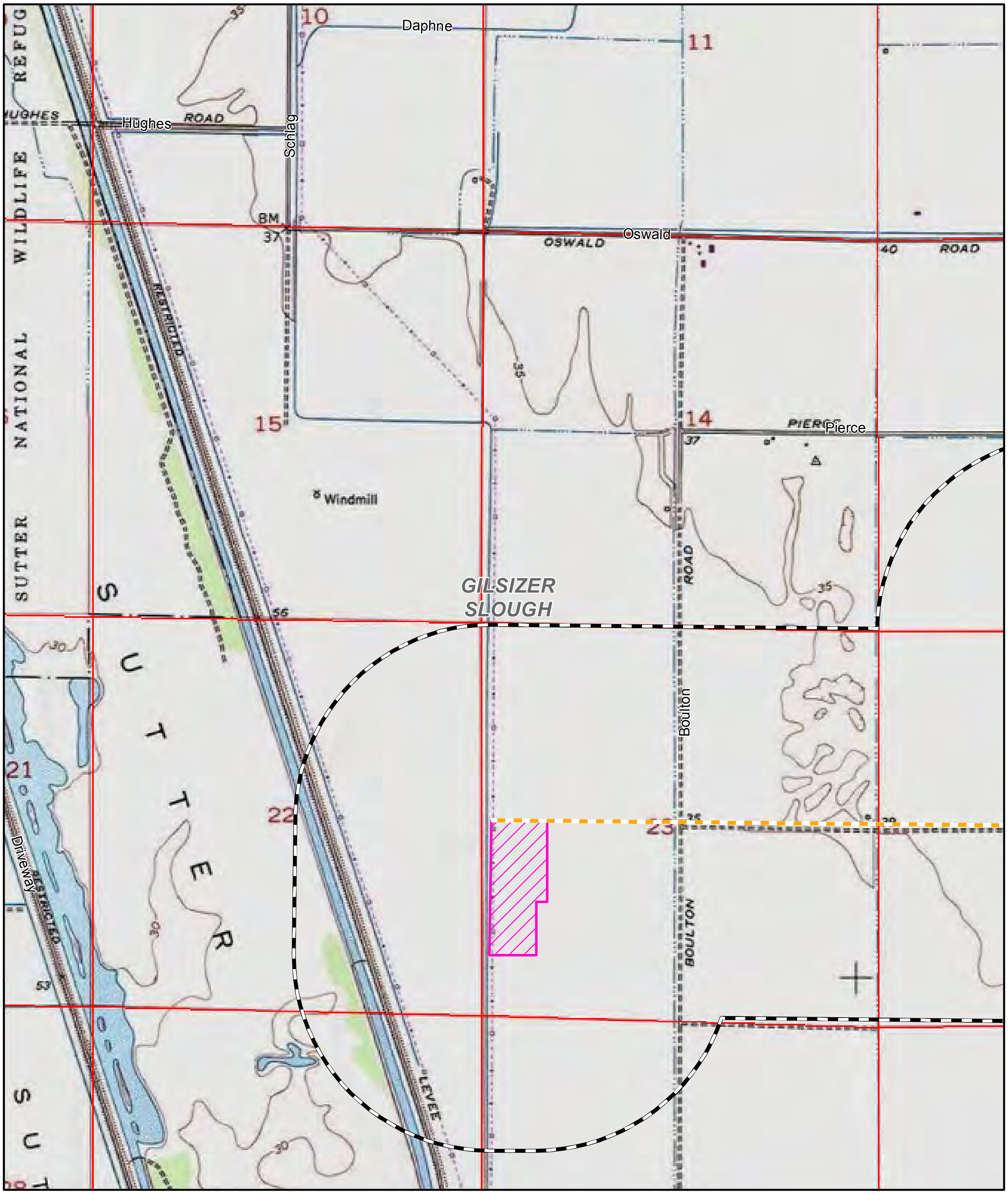
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

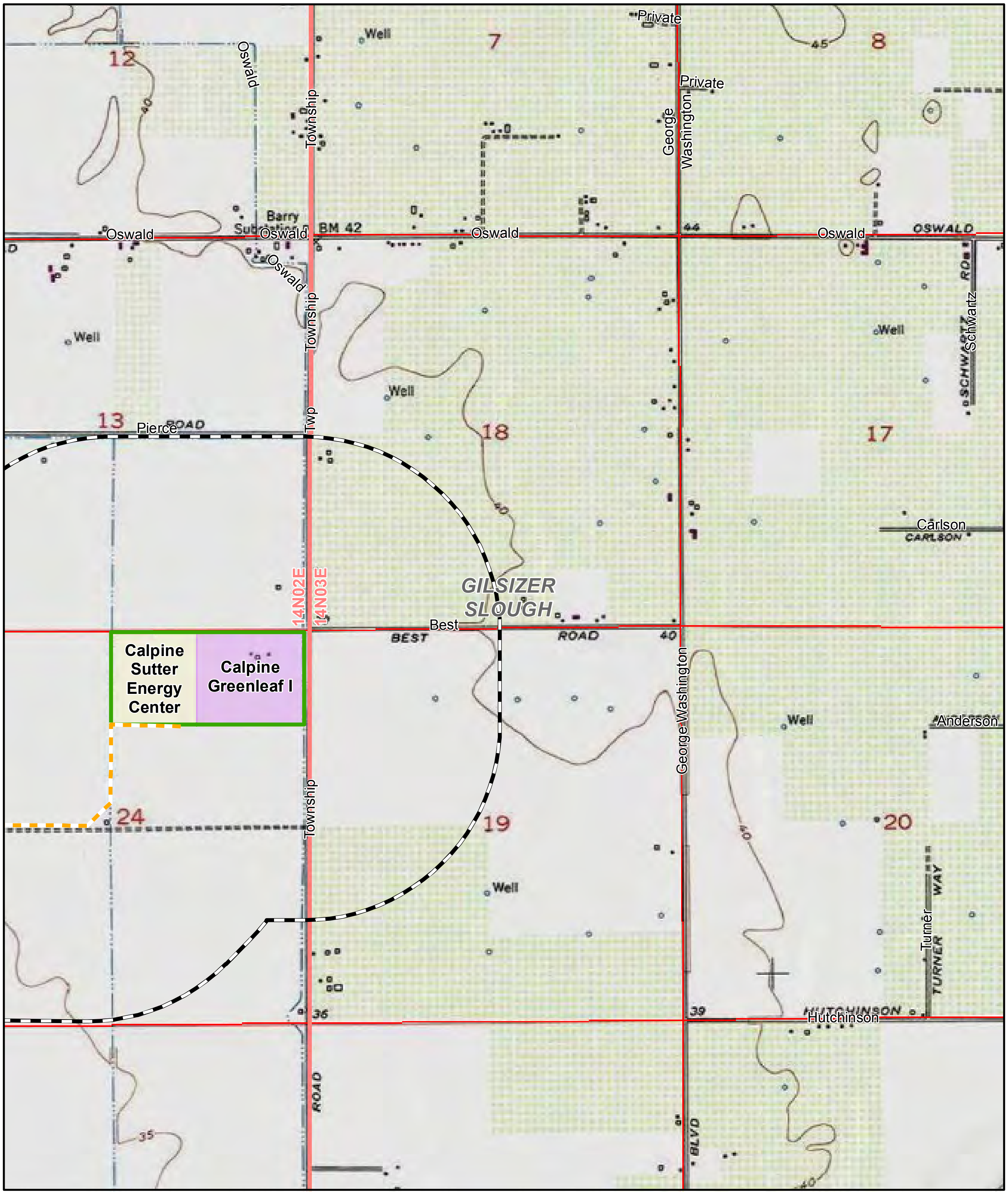
0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM

CH2MHILL



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL.

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

Mechoopda Indian Tribe of Chico Rancheria
Mike DeSpain, Director-OEPP
125 Mission Ranch Blvd
Chico, California 95926
mdespain@mechoopda-nsn.gov

Re: Sutter Energy Center, Petition to Amend

Dear Mr. DeSpain:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

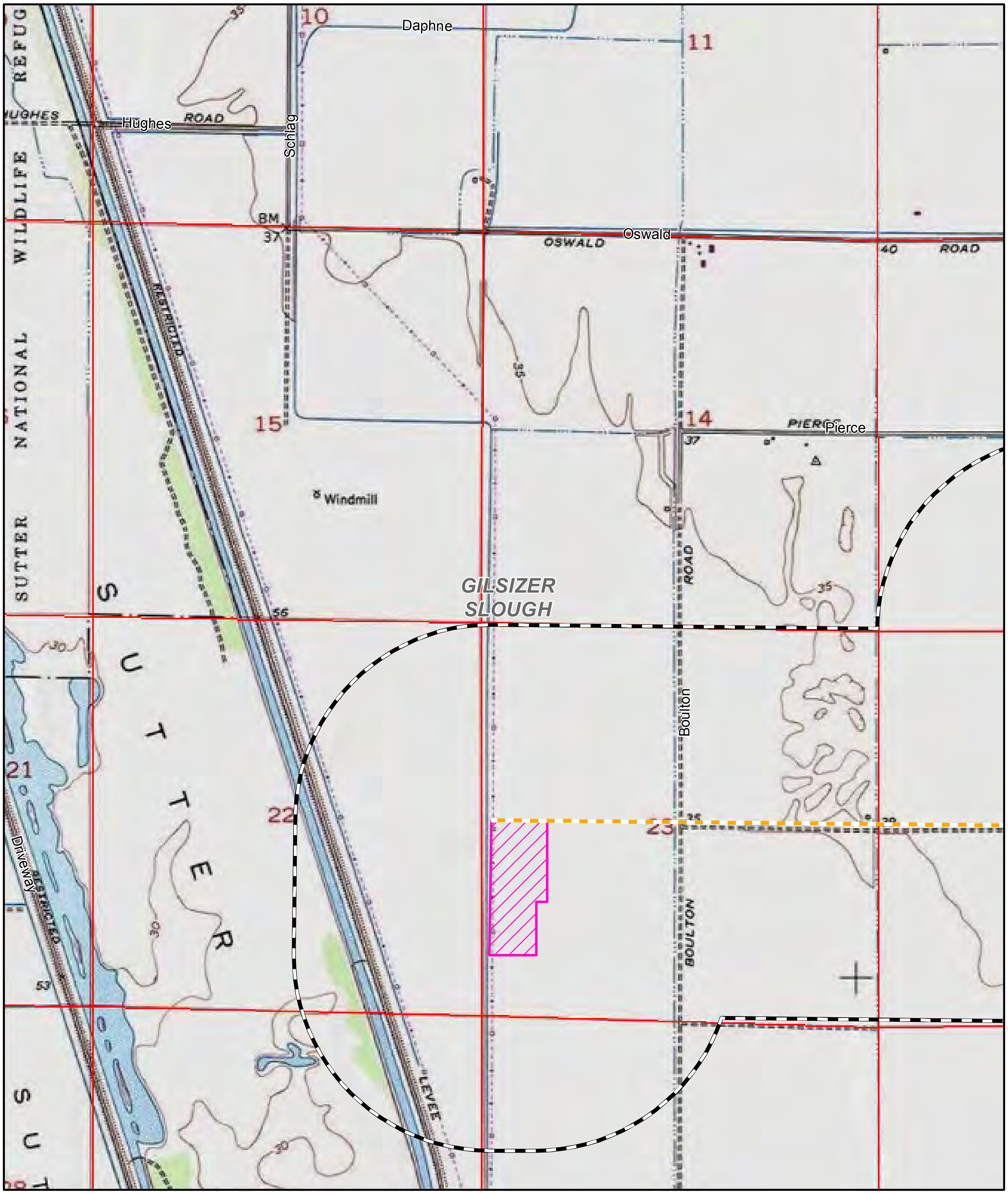
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

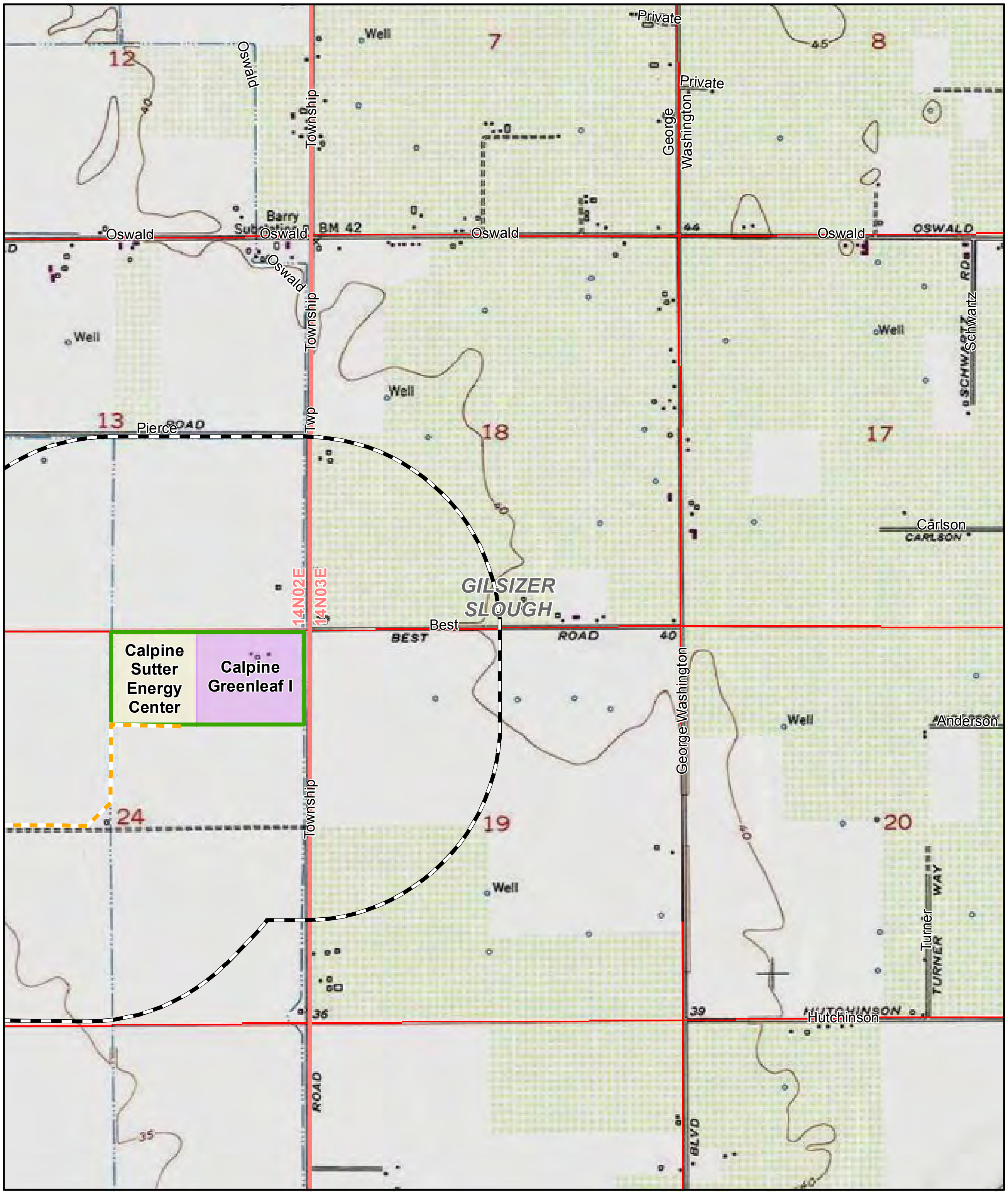
- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL.



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

United Auburn Indian Community of the Auburn Rancheria
Marcos Guerrero, Tribal Preservation Committee
10720 Indian Hill Road
Auburn, California 95603
mguerrero@auburnrancheria.com

Re: Sutter Energy Center, Petition to Amend

Dear Mr. Guerrero:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

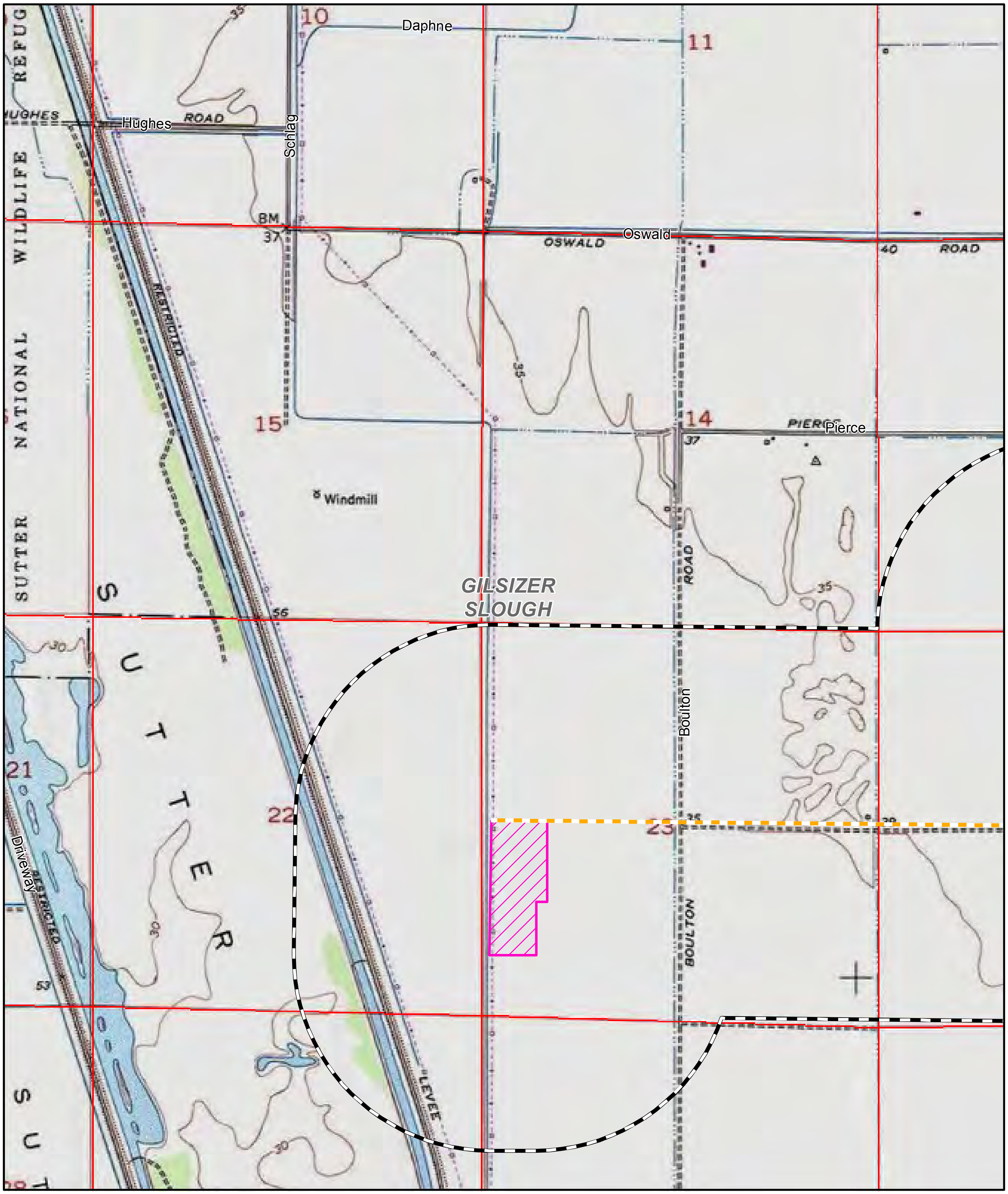
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

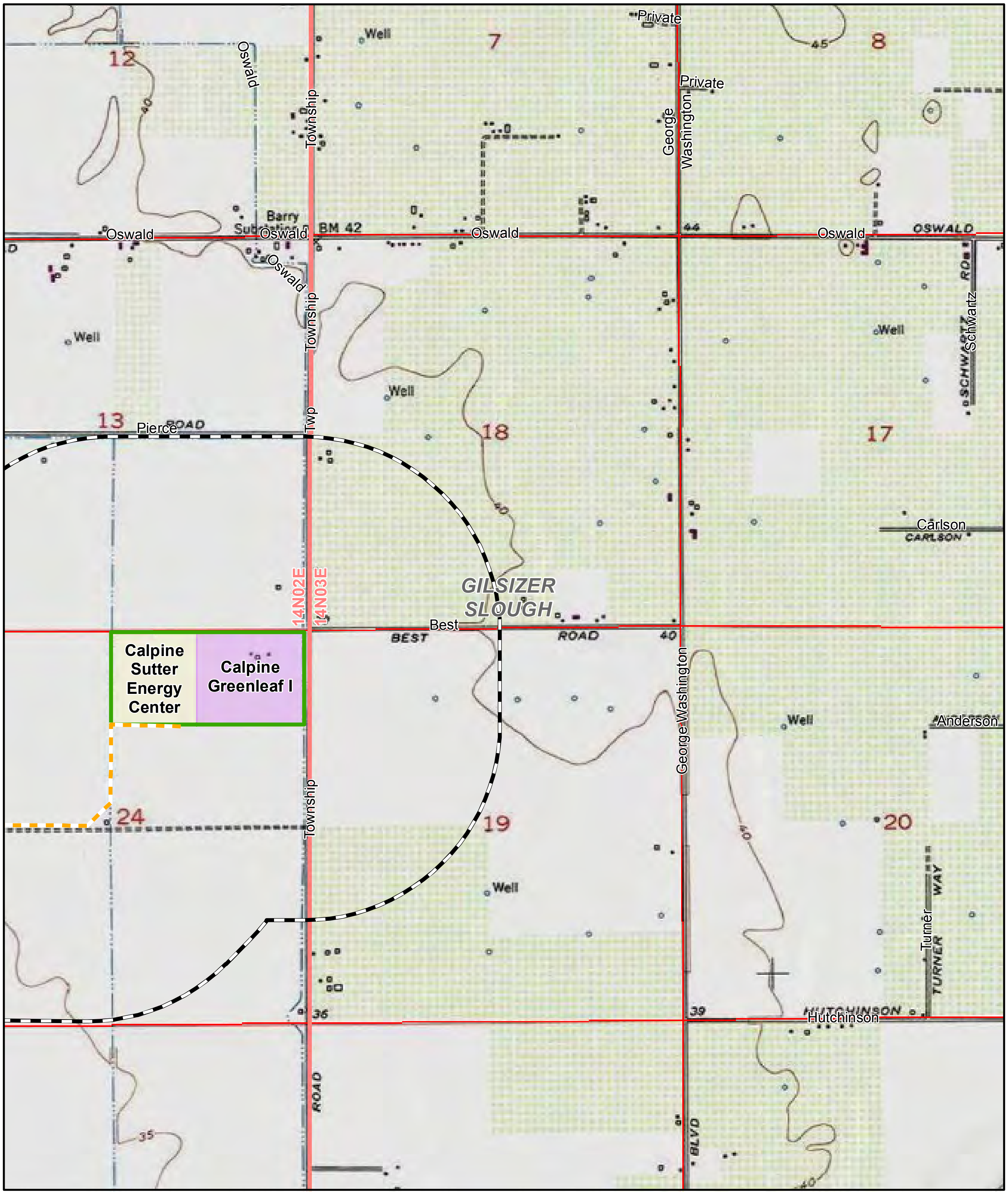
- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL.



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

United Auburn Indian Community of the Auburn Rancheria
David Keyser, Chairperson
10720 Indian Hill Road
Auburn, California 95603

Re: Sutter Energy Center, Petition to Amend

Dear Mr. Keyser:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

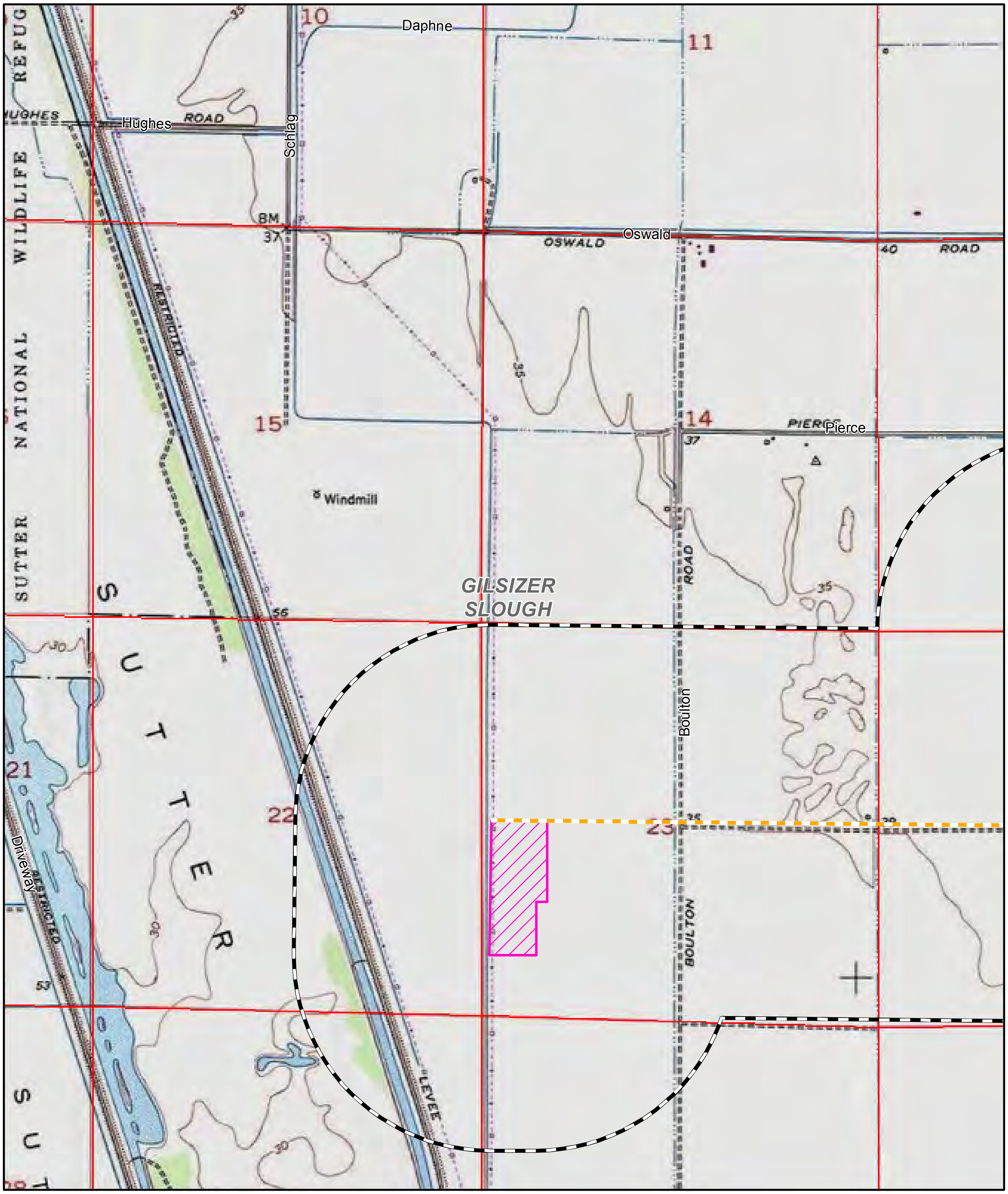
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

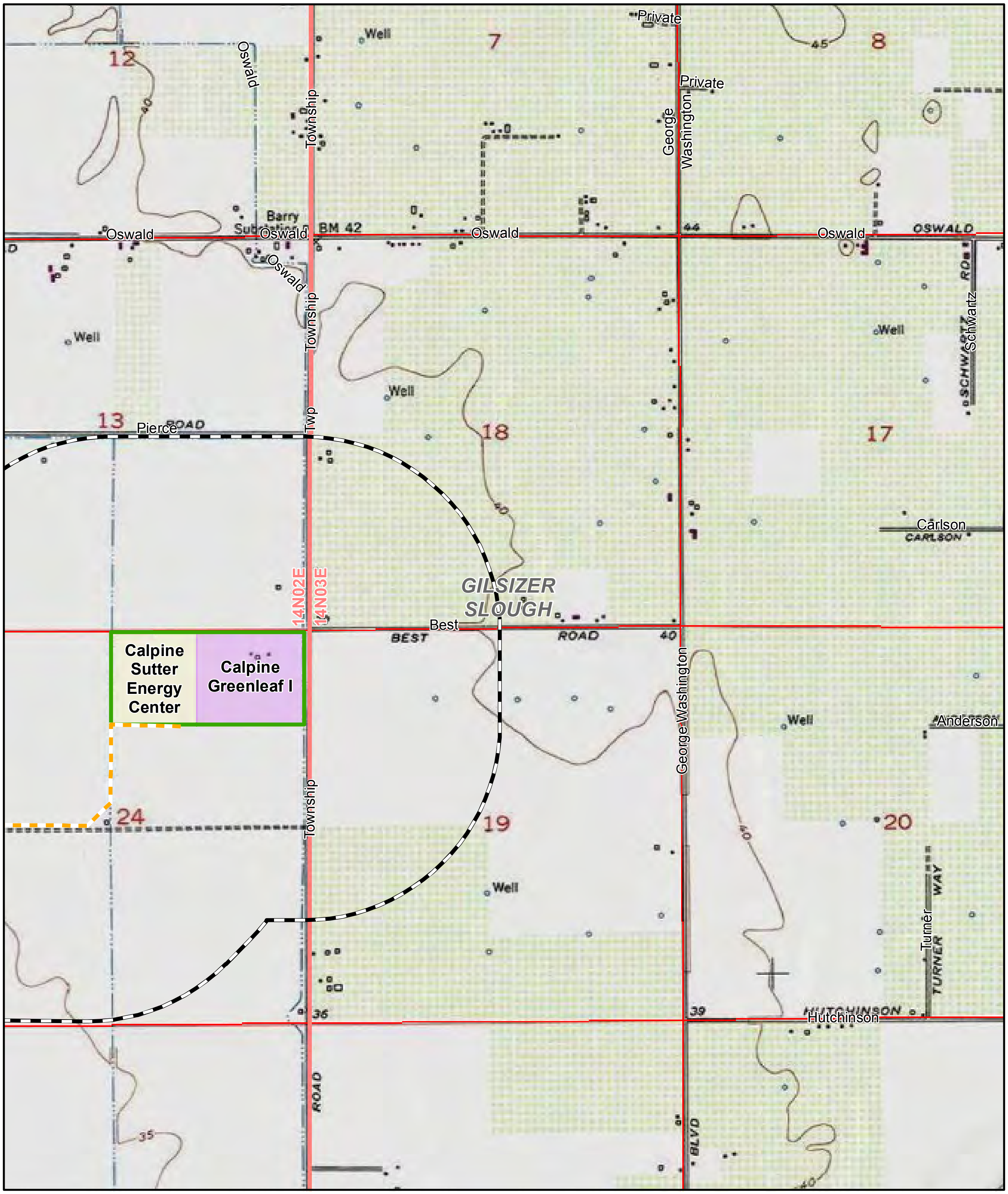
0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
2133 Monta Vista Avenue
Oroville, California 95966
info@enterpriserancheria.com

Re: Sutter Energy Center, Petition to Amend

Dear Ms. Nelson:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

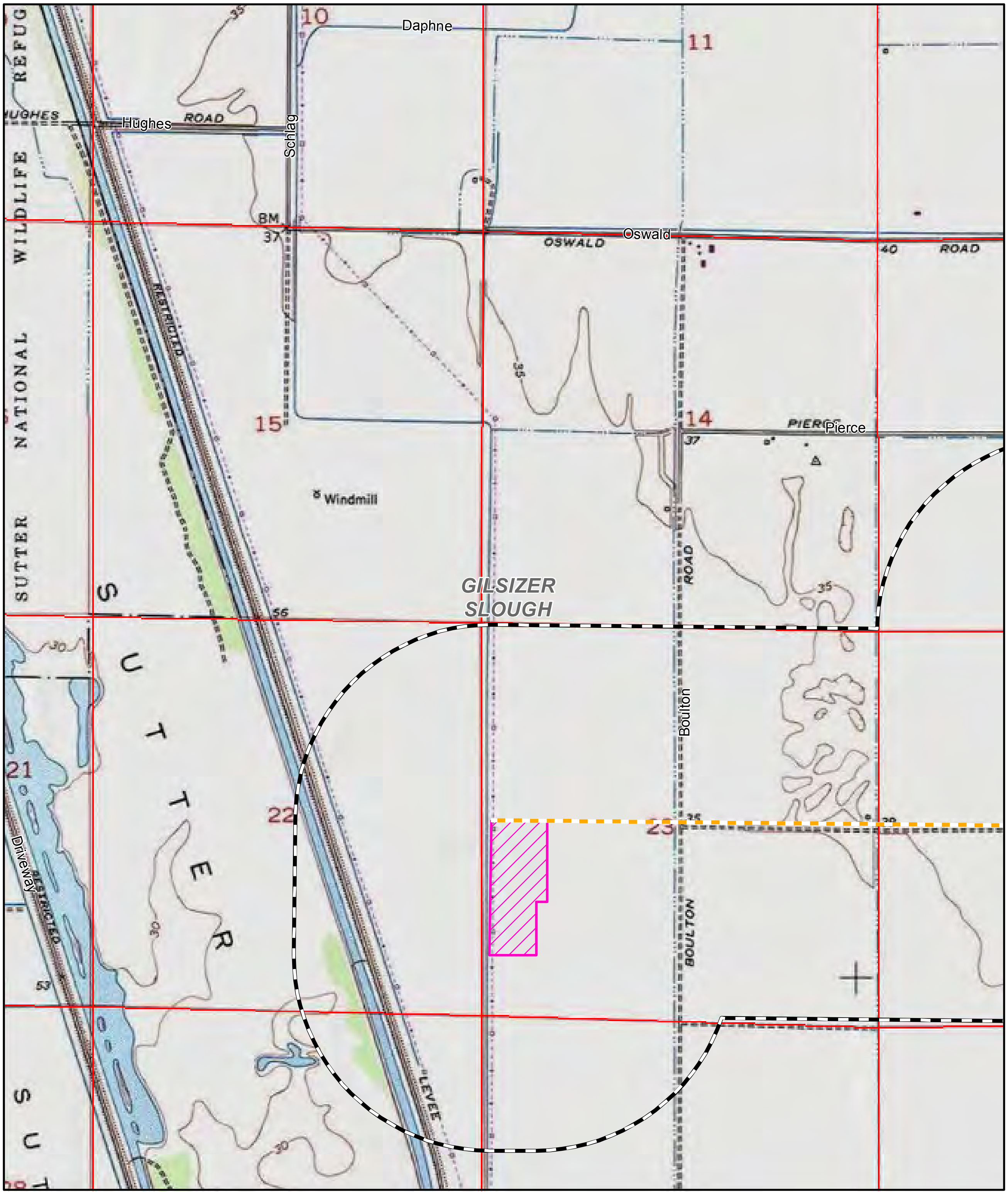
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

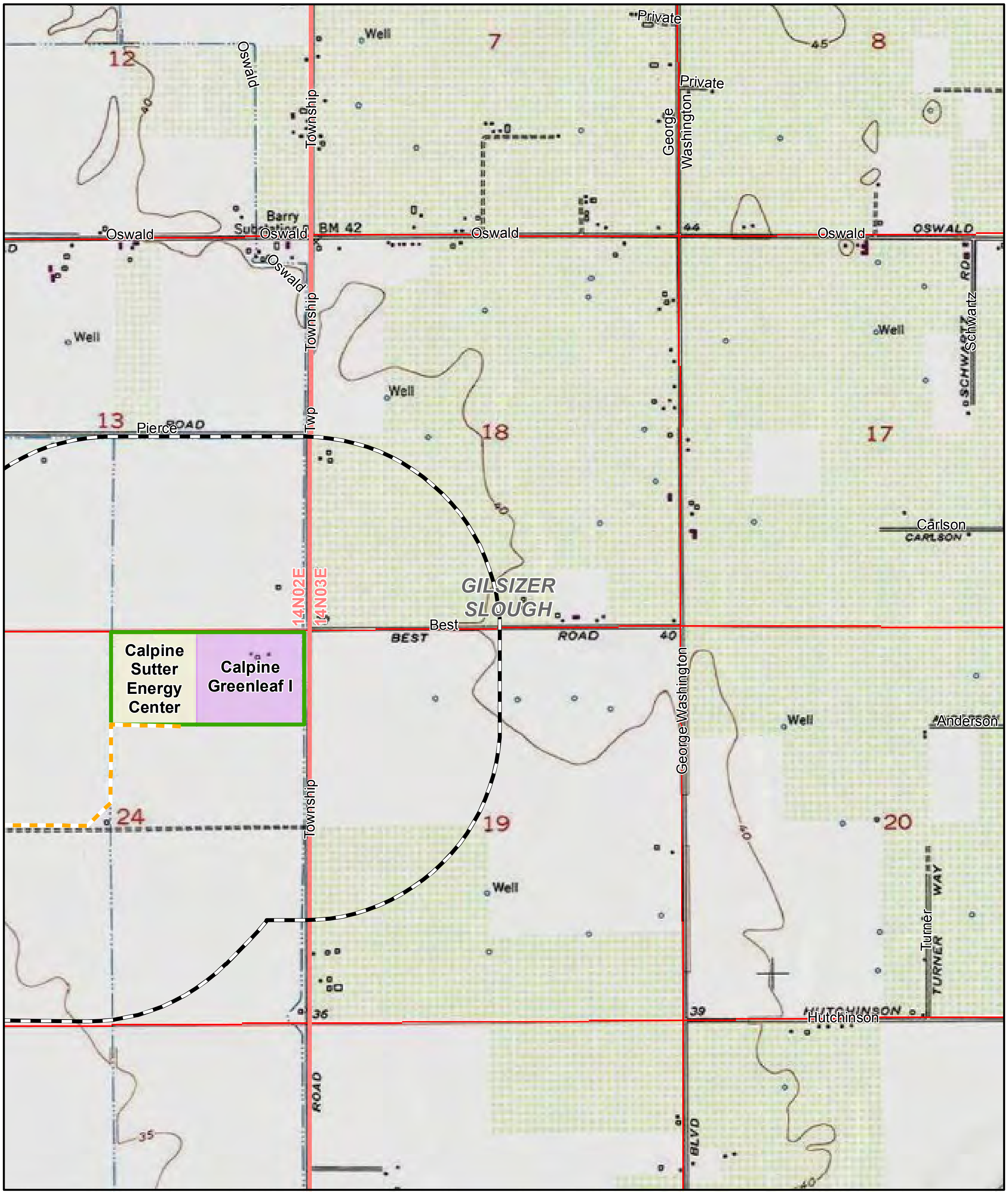
- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM

CH2MHILL.

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

CH2MHILL

February 4, 2013

Mechoopda Indian Tribe of Chico Rancheria
Dennis E. Ramirez, Chairperson
125 Mission Ranch Blvd
Chico, California 95926
dramirez@mechoopda-nsn.gov

Re: Sutter Energy Center, Petition to Amend

Dear Mr. Ramirez:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

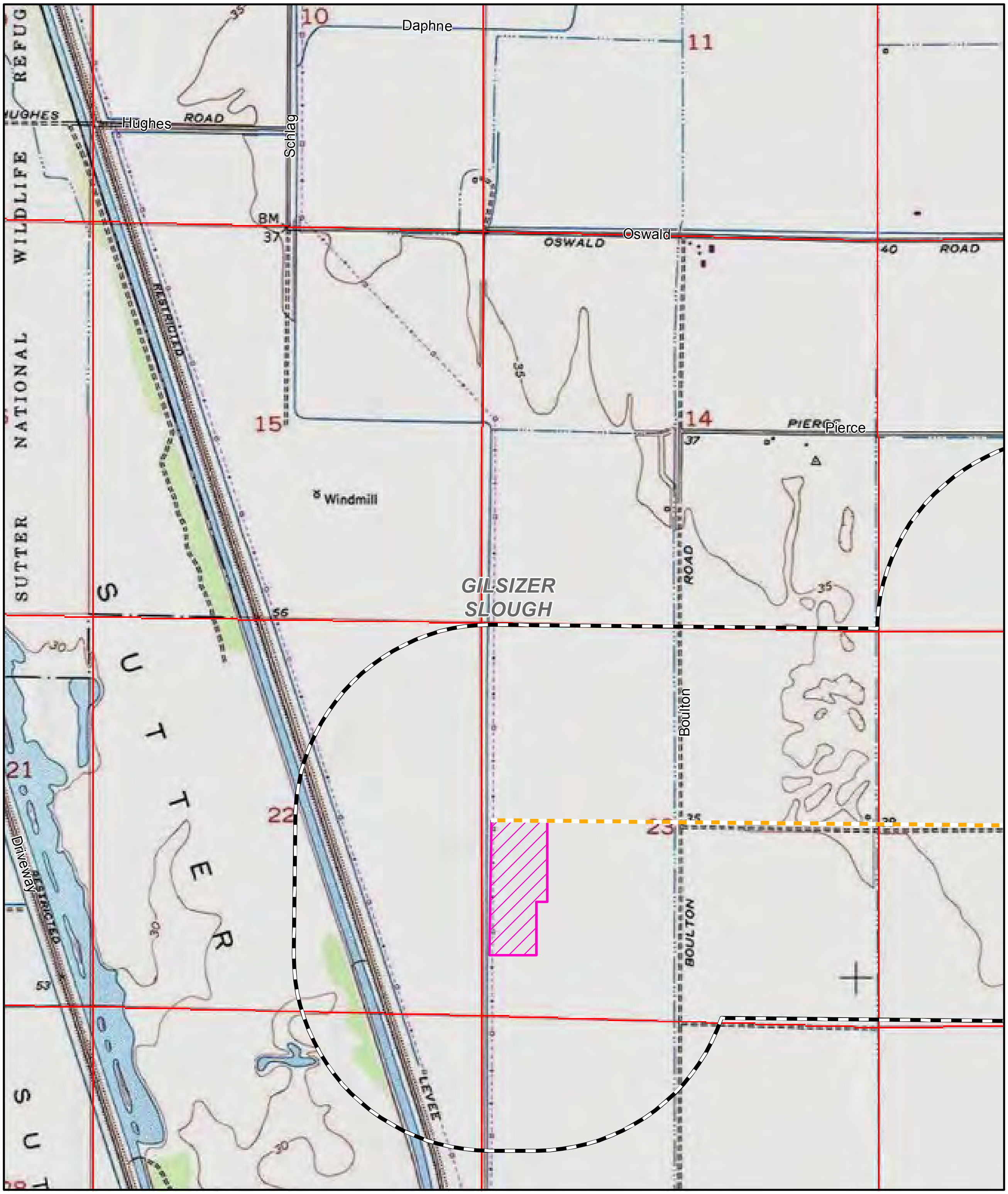
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

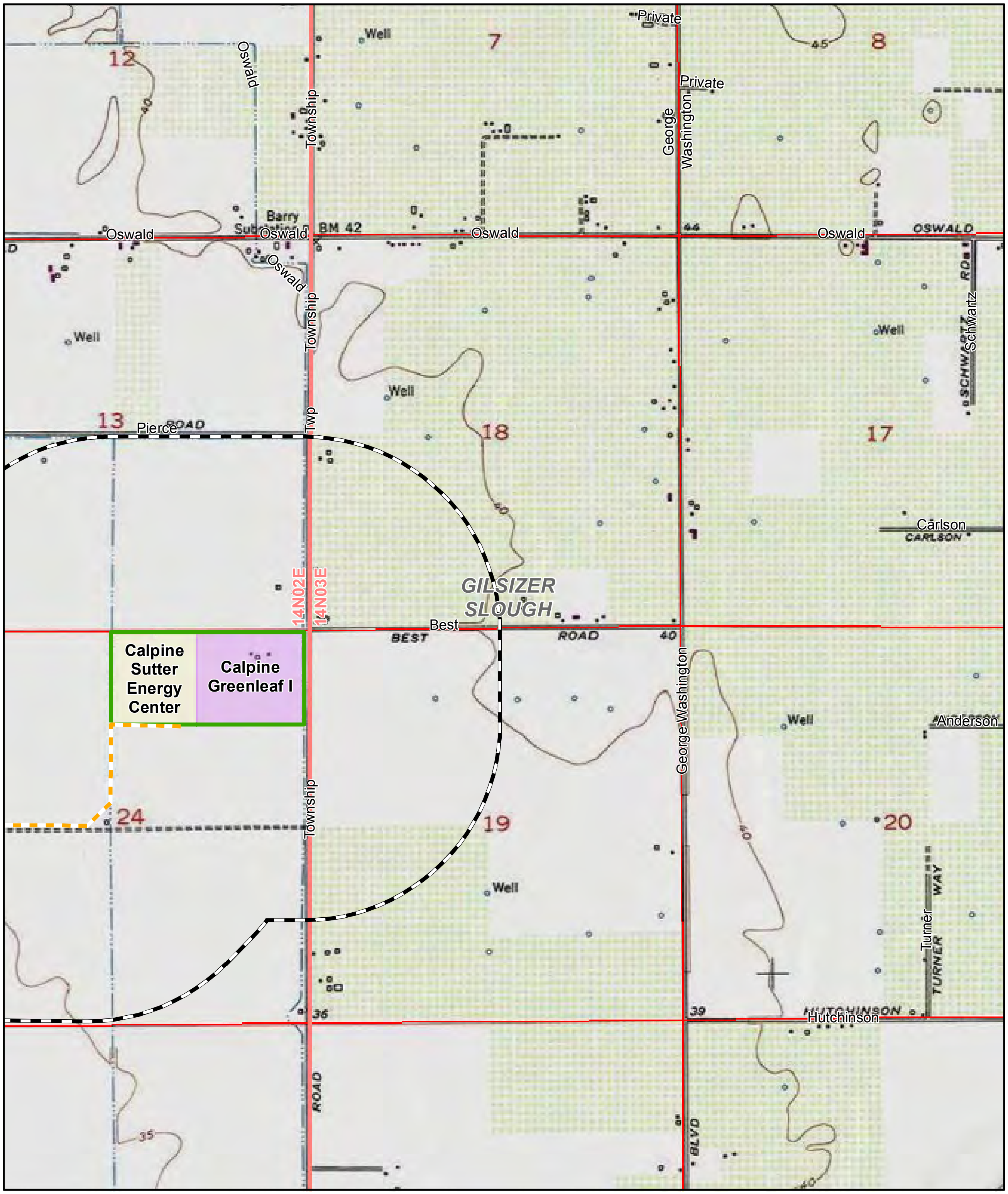
0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM

CH2MHILL



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

CH2M HILL
6 Hutton Centre Drive
Suite 700
Santa Ana, CA 92707
Tel 714.628-9666
Fax 714.424-2246

February 4, 2013

United Auburn Indian Community of the Auburn Rancheria
Danny Rey, THPO
10720 Indian Hill Road
Auburn, California 95603
dannyr@auburnrancheria.com

Re: Sutter Energy Center, Petition to Amend

Dear Mr. Rey:

CH2M HILL is assisting the Calpine Corporation (Calpine) with a Petition to Amend (PTA) the Calpine's California Energy Commission (CEC) license for the Sutter Energy Center (Sutter). Calpine seeks to install equipment upgrades at Sutter that will allow faster starts, quicker ramp rates, and higher efficiencies to meet the power service demands of today's electrical system. Because Calpine holds a CEC licenses for this facility, the equipment changes will require amendments to the license. Calpine desires to make the following equipment modifications at Sutter:

- Turbine upgrade
- Add auxiliary boiler
- Thermal decoupling
- Fuel conditioning
- Heat conservation
- Air-cooled condenser

In addition to the equipment upgrades, Calpine proposes to construct a new substation and a new, 1.7-mile-long generator tie-line that will connect the Sutter plant with a PG&E transmission line that parallels the Western Area Power Administration 500 kV transmission line and is located west of the power plant site.

The proposed project is located on portions of Township 14 North, Range 2 East, Sections 22, 23, and 24 and Township 14 North Range 3 East, Sections 18 and 19 within the jurisdiction of the City of Yuba, California.

A project map is provided with this letter.

A literature search was completed at the California Historical Resources Information System (CHRIS) Northeastern Information Center (NEIC) at the California State University, Chico. The literature search revealed that no cultural resources have been previously recorded within the proposed Project.

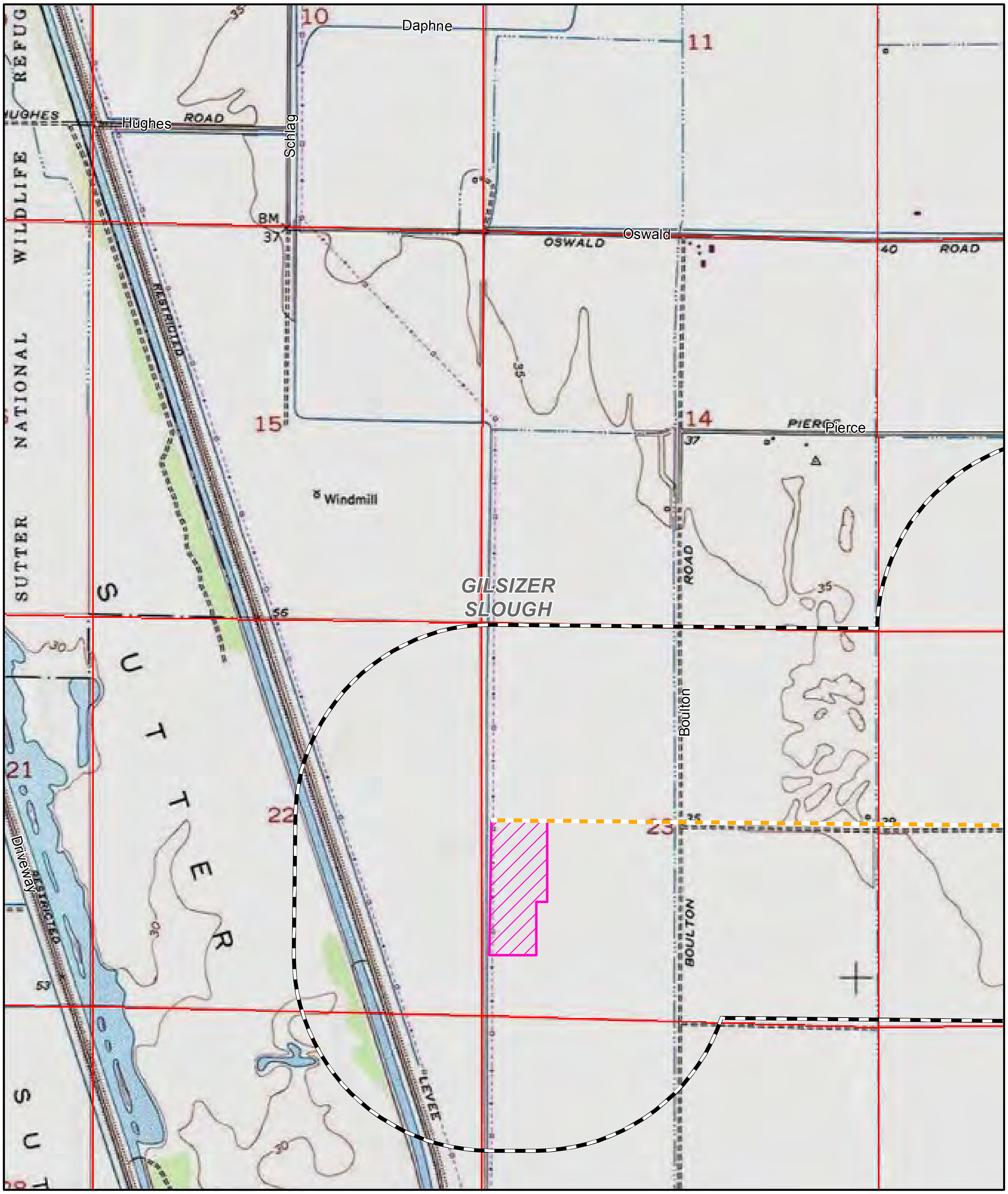
A search of the Sacred Land files by the Native American Heritage Commission (NACH) in December 2012 failed to indicate the presence of Native American sacred sites in the immediate Project vicinity. Comprehensive cultural resources studies, including field surveys, are currently being conducted.

If you know of any traditional cultural properties or values (e.g., burial sites, religious sites, or gathering sites) within the Project area shown on the enclosed map, or if you have any concerns regarding issues related to the overall Project, please contact me at (714) 628-9666 or by mail; you may also contact me at nlawson@ch2m.com. Your project comments and concerns are important to us. I look forward to hearing from you in the near future.

Respectfully yours,

Natalie Lawson, M.A., RPA
Cultural Resources Specialist

Enclosure—Map of Project Area (2)



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

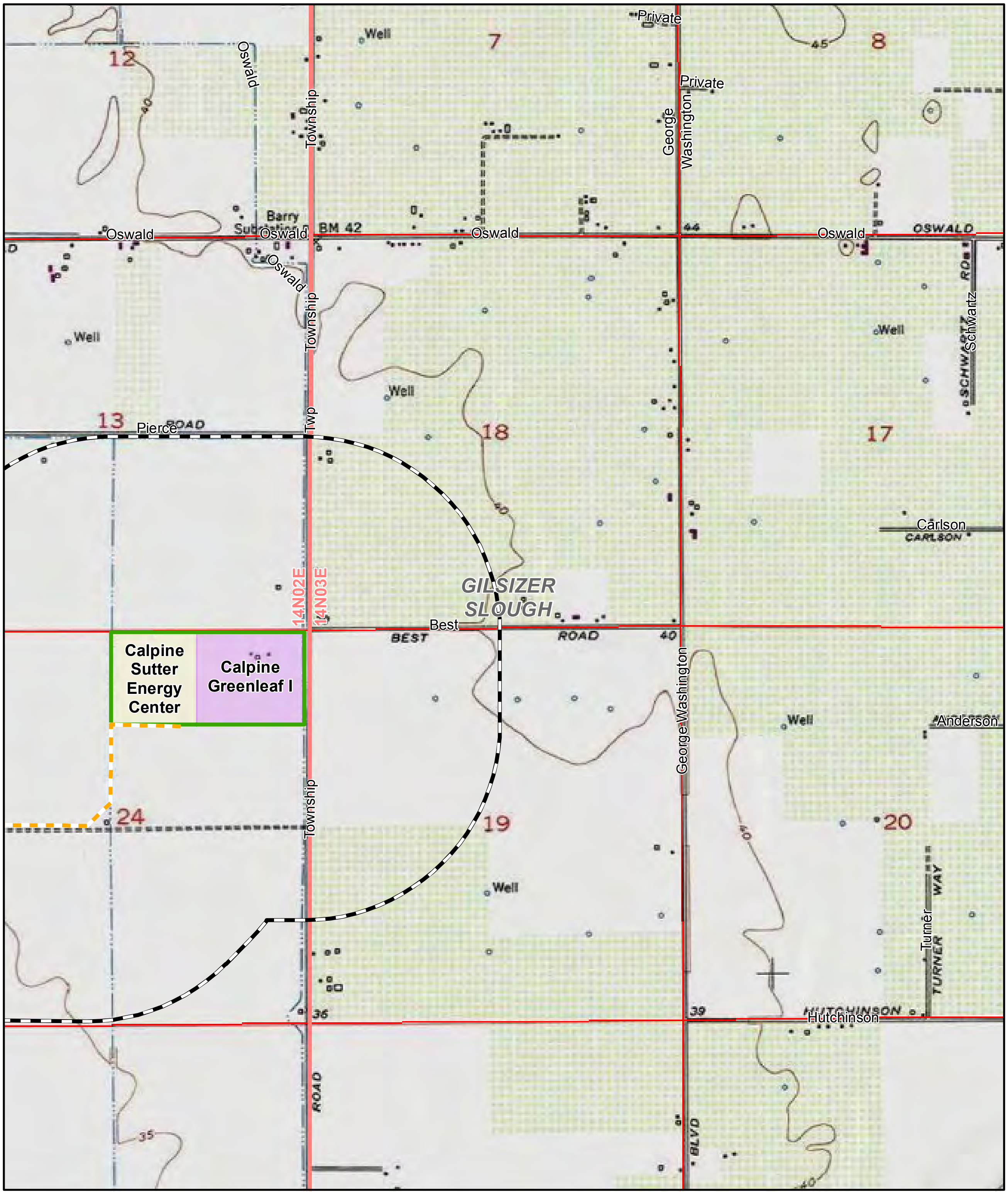
0 1,000 2,000
Feet

N

Page - 1
Cultural Map
Sutter Energy Center

CH2MHILL.

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM



LEGEND

- Proposed Underground Transmission Line
- Calpine
- Calpine Greenleaf I
- Calpine Sutter Energy Center
- Proposed Substation
- USGS 24K Quad Boundary
- Township/Range
- Section
- Buffer - 1/2 Mile

0 1,000 2,000
Feet

N

Page - 2
Cultural Map
Sutter Energy Center

CH2MHILL

SAC \\ZION\SACGIS\PROJ\SUTTER_ENERGY_CENTER\MAPFILES\SEC_CULTURAL.MXD KMINO 12/18/2012 9:40:58 AM

Appendix 3.7A
2011 Calpine Noise Monitoring Study

DATE: December 29, 2011

TO: Larry Sessions
Perry Windecker

FM: Patrick Kelly
CIH, CSP
Calpine Regional Health and Safety Manager

RE: Results of Noise Compliance Test at Sutter Energy Center, November 14 and 15, 2011

Summary

Sound measurements were taken at the Sutter Energy Center (SEC) for a 24 hour period beginning at 3:30 p.m. on Monday, November 14, 2011 and continuing through 3:30 p.m. on Tuesday, November 15, 2011. The purpose of this testing was to verify the continued compliance of the SEC with the applicable regulatory requirements.

Sound levels were monitored at one location at the power plant and at the three nearest residences. Monitoring was done at a fourth residence, but due to an instrument malfunction no data was retrieved from that site. These monitoring locations are the same sites as used in the 2001 noise compliance study as indicated on the attached map. Based on the noise measurements from this study it is my opinion that the SEC does not contribute to noise levels that exceed 45 dBA at the residences monitored. This conclusion is discussed below.

Description of Monitoring Sites

The residential monitoring was done using 4 Larson Davis model SLM820 type 1 sound level meters equipped with a 3.5" wind screen and noise monitoring at the power plant site was done using a Quest model Q500 type 1 sound level meter equipped with a 3" wind screen. All monitors were calibrated both before and after the monitoring event. The monitoring locations are as follows:

Site 1 – at 4879 S. Township Rd, monitor located south of residence on telephone cable box about 10 ft. from roadway and about 2 – 3 ft. above ground level. This site is about 2500 ft, northeast of the SEC. Noise measurements taken between about 1100 hr and 1345 hr on 11/15/11 were not recovered. This data loss occurred during a non-critical time when the primary noise contributors are local activity and traffic. This is a minor data loss that does not affect the validity of the noise compliance evaluation for this site.

Site 2 – at 4660 S. Township Rd, monitor located south of residence on power pole at edge of driveway about 20 ft. from roadway and about 4 – 5 ft above ground level. This site is about 3400 ft, northeast of the SEC.

Site 3 – at 4466 Pierce Rd., monitor located south of residence on fence post just south of horse corral about 100 ft. from roadway and about 4 – 5 ft above ground level. This site is about 3000 ft. north of the SEC.

Site 4 – at 5794 S. Township Rd., monitor located on short post about 50 ft. north of residence, about 15 ft. from roadway and about 1 ft. above ground level. This site is about 4400 ft. southeast of the SEC. No data recovered from this location. This site is furthest from the SEC and the only site to the south. While information from this site would have been useful, the noise study can be very adequately completed without this information.

Site L5 – at the SEC facility, monitor located near northwest corner of plant site at egress gate about 4 – 5 ft. above ground level.

A site map is shown in figure 3.1

Weather

Wind during this monitoring period was generally negligible. The county agricultural weather station located at the Sutter County Airport, about 7 – 8 miles from the power plant logged sustained breezes of less than 5 mph with a few gusts up to 10 mph between 9:30 am and about 4:00 p.m. on November 15 primarily from the WNW. Their records indicate no measurable winds at other times during the testing period. There was no precipitation during this time and little or no fog. Temperatures ranged from a high of about 66 f to a low of about 50 f. The ag station weather data can be found in figures 4.1 and 4.2.

Plant and Equipment Configuration and Run Schedule

- Sutter Energy Center
  - HRSG-1: silencer in place
  - HRSG-2: silencer removed
  - Plant operation variable between 340 mw and 505 mw – see attached run plot for details
- Greenleaf 1 PP (GL1)
  - Plant operation variable between 47 mw and 50 mw – see attached run plot for details
- Dryers
  - Operated between 1500 – 2000 hr on 11/14/11, shutdown during remainder of noise monitoring test.

Run plot for SEC and GL1 is shown in figure 5.1

Criteria

Sutter County General Plan dated 11/25/1996 Section 8 – Noise.
Table 7 of this policy document identifies both daytime and nighttime noise level limits for non-transportation noise sources. These limits are 45 dBA nighttime hourly L_{eq} and 50 DBA daytime hourly L_{eq}. In addition Table 7 specifies a nighttime L_{max} of 65 dBA and a daytime L_{max} of 70 dBA.
The Conditions of Certification from the CEC require that noise levels in excess of 45 dBA (L_{eq}) at the nearest residence be mitigated to below the 45 dBA level.

Discussion

A primary challenge in this type of noise environment is differentiating plant induced noise from the noise caused by wind, frogs, traffic and routine residential and agricultural activity. The 1997 Calpine Application for Certification, Section 8.5 Noise, part 8.5.1.1 states that "The sources of noise were similar at all locations. Noise from wind and rustling grass was significant during the afternoon. Frogs and insects also provided significant background noise at night with levels generally above 50 dBA." The frogs are probably not as loud in November as in June, but they can still be a major contributor to night time noise levels. This type of ambient noise can continue for a majority of the night time hours making it difficult to differentiate plant noise from ambient noise.

The noise from the operating power plant is steady at 62 -64 decibel measured at the north fence line of the SEC site and is essentially unaffected by variations in the load generation of the power plant. Since this noise source is very consistent, the noise contribution at the receptor sites should also be consistent. One way to try and identify the consistent noise level is to look at the L90 sound level which provides a measure of the minimum noise levels recorded. By looking at this value on an hourly basis, most of the variable noise can be eliminated, and the L90 value will reflect the more consistent noise levels that might be attributed to a consistent noise source such as the SEC.

Day time noise levels measured at sites 1 and 2 are highly affected by traffic on S. Townsend Rd. and also by rice harvesting activity on the afternoon of 11/14. As shown by the 1 minute Leq charts for these sites provided in figures 1.1 and 1.2, daytime noise is highly variable with short term spikes over 70 dB occurring routinely throughout the day. This type of highly variable noise level is inconsistent with the power plant noise and it's clear that during the day noise from the SEC has negligible impact on the overall noise levels at these locations.

Night time noise levels (10 p.m. to 7 a.m.) at sites 1 and 2 is less affected by traffic noise, but does appear to be influenced by other ambient noise sources. Site 1 is about 2500 feet northeast of the SEC and site 2 is about 1000 feet further north on the same road. Given the location of these sites with respect to the SEC, the measured noise at site 1 should be greater than at site 2 if the source of the noise is the SEC. However, during the night time hours the average L90 sound levels at site 2 are greater than the same measurements at site 1 at least 50% of the time. This is shown in figure 2.1 bar chart. This is a very strong indicator that the night time noise levels at these locations is primarily influenced by non-SEC noise sources.

The L90 noise levels at site 3 are below the 45 dB threshold except for a few early morning hours. This noise measurement is slightly above 45 dB at this site at 4 and 5 am and again at 7 am. Since the L5 noise monitoring site at the edge of the SEC facility is between the SEC noise sources and site 3, if the SEC is contributing to the measured noise levels at site 3, any significant change at site 3 should be also be reflected at the L5 site. This is not the case. The 7 a.m. variance is clearly due to local activity as shown by the high variability of the one minute Leq readings around this time as shown by the graph in figure 1.3. This graph also shows that between the hours of 10 p.m. on 11/14 and 5 a.m. on 11/15 the 1 minute Leq at site 3 increases from about 40 dB to about 50 dB while the 1 minute Leq at the L5 site stays consistent between 62 and

64 dB. The graph in Figure 2.2 also shows the L90 sound levels at site 3 steadily increasing throughout the night time hours with no corresponding change in the SEC sound levels at site L5. This indicates the increased noise levels at site 3 during these morning hours are not due to the SEC.

Errata

This report dated 12/29/11 includes edits and corrections to reported dated 12/19/11 and a correction to the silencer configuration as listed in the report dated 12/28/11.

Figures

Figure 1.1 Site 1: I minute L_{eq} levels

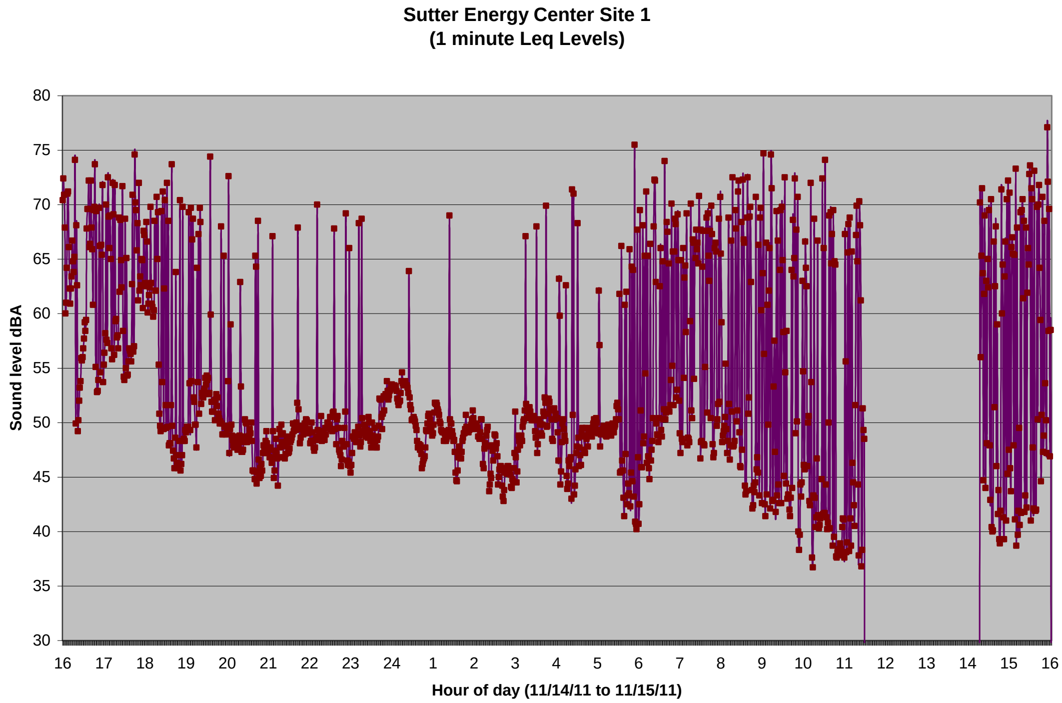


Figure 1.2 Site 2: I minute L_{eq} levels

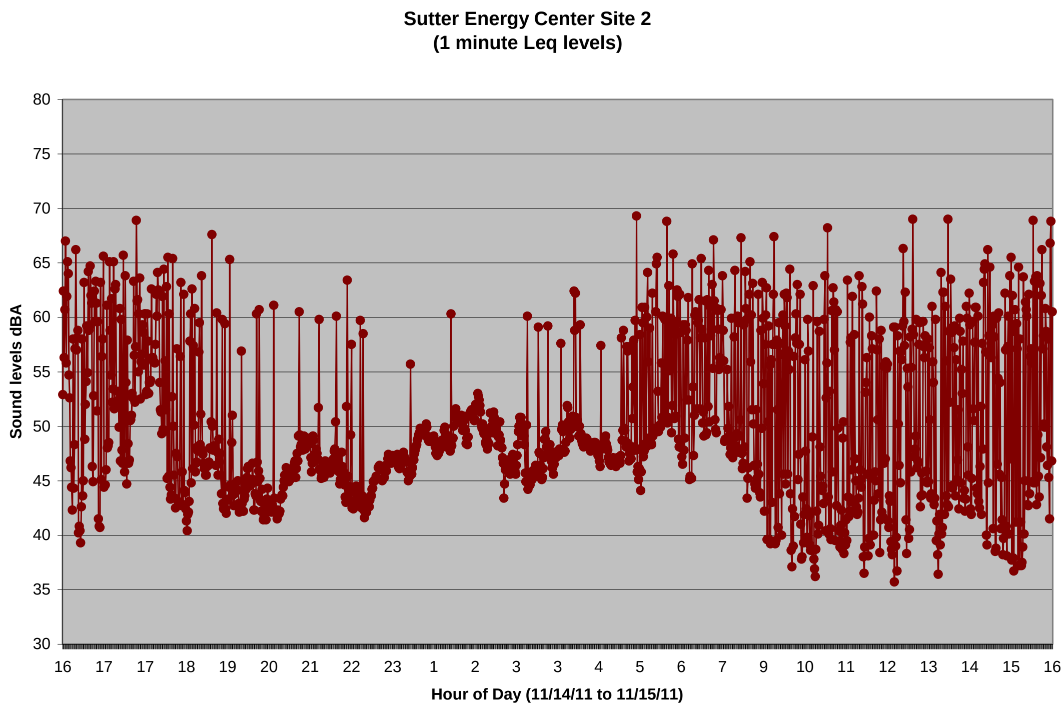


Figure 1.3 Site 3: I minute L_{eq} levels

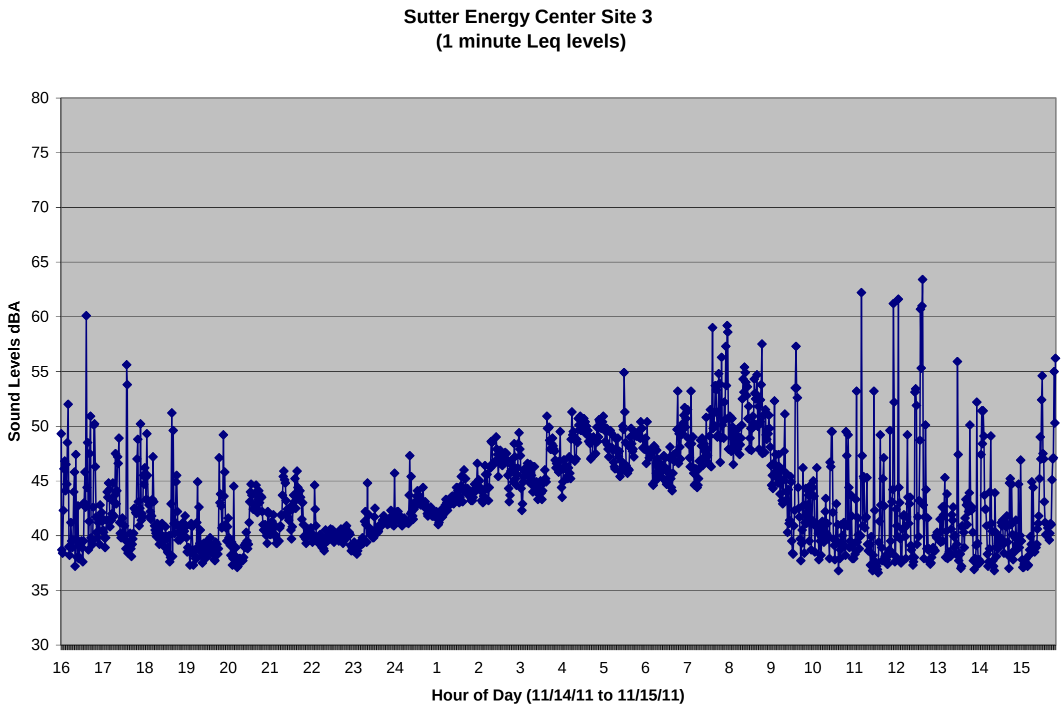


Figure 1.4 Site L5: I minute L_{eq} levels

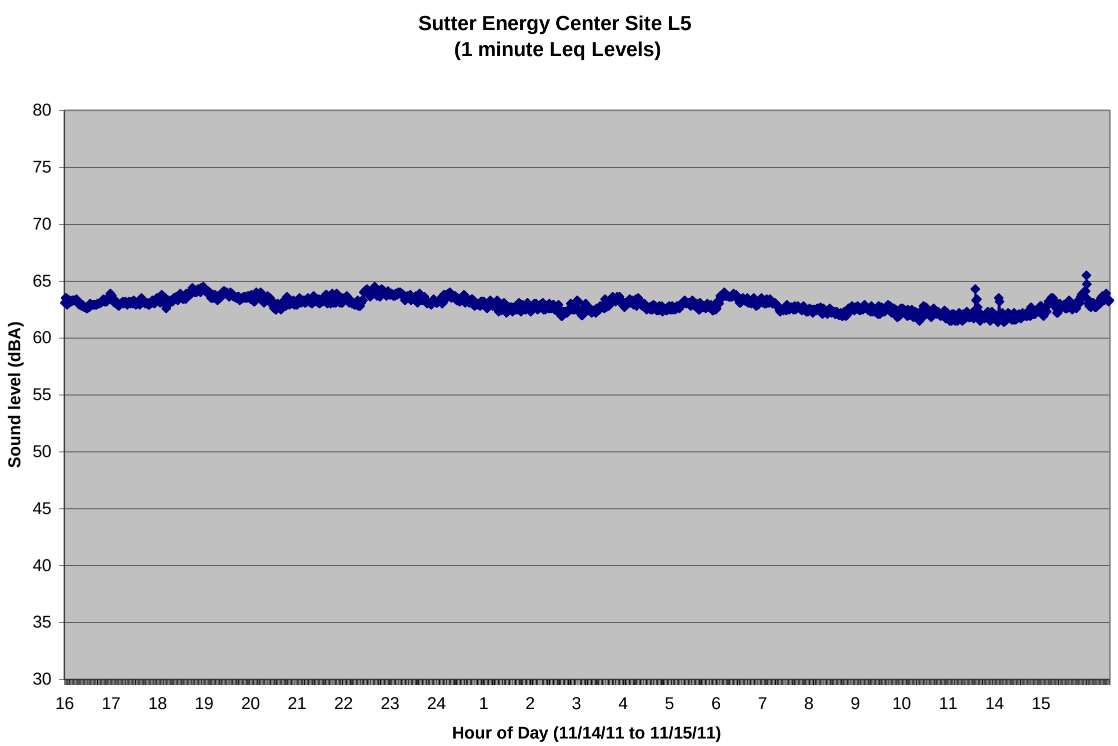


Figure 2.1 Sites 1 and 2: Hourly L_{90} Sound Levels

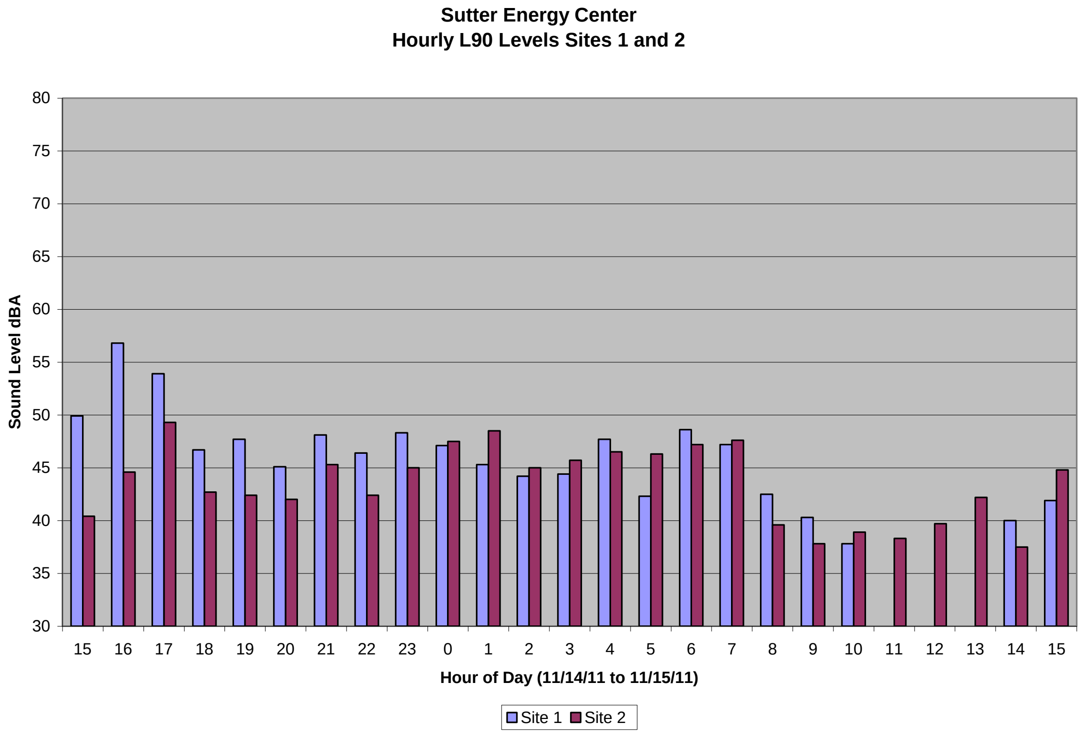


Figure 2.2 Site 3 and L5: Hourly L_{90} Sound Levels

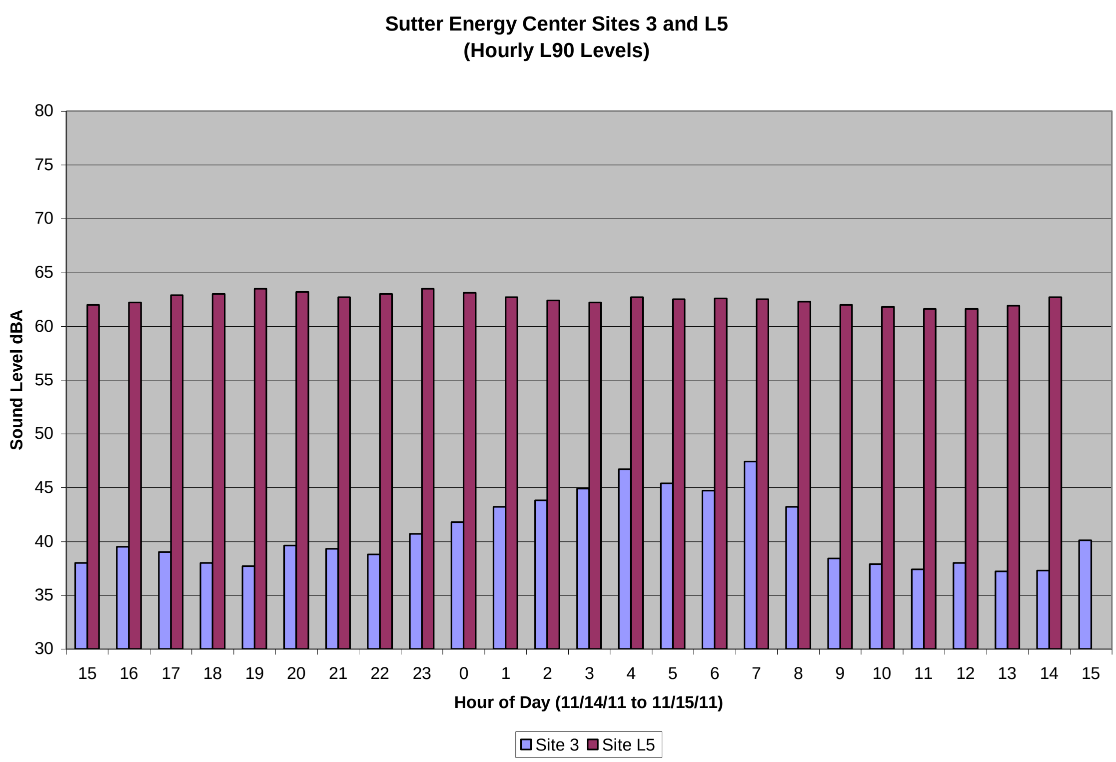


Figure 3.1 Sutter Energy Center Map of Noise Monitoring Sites

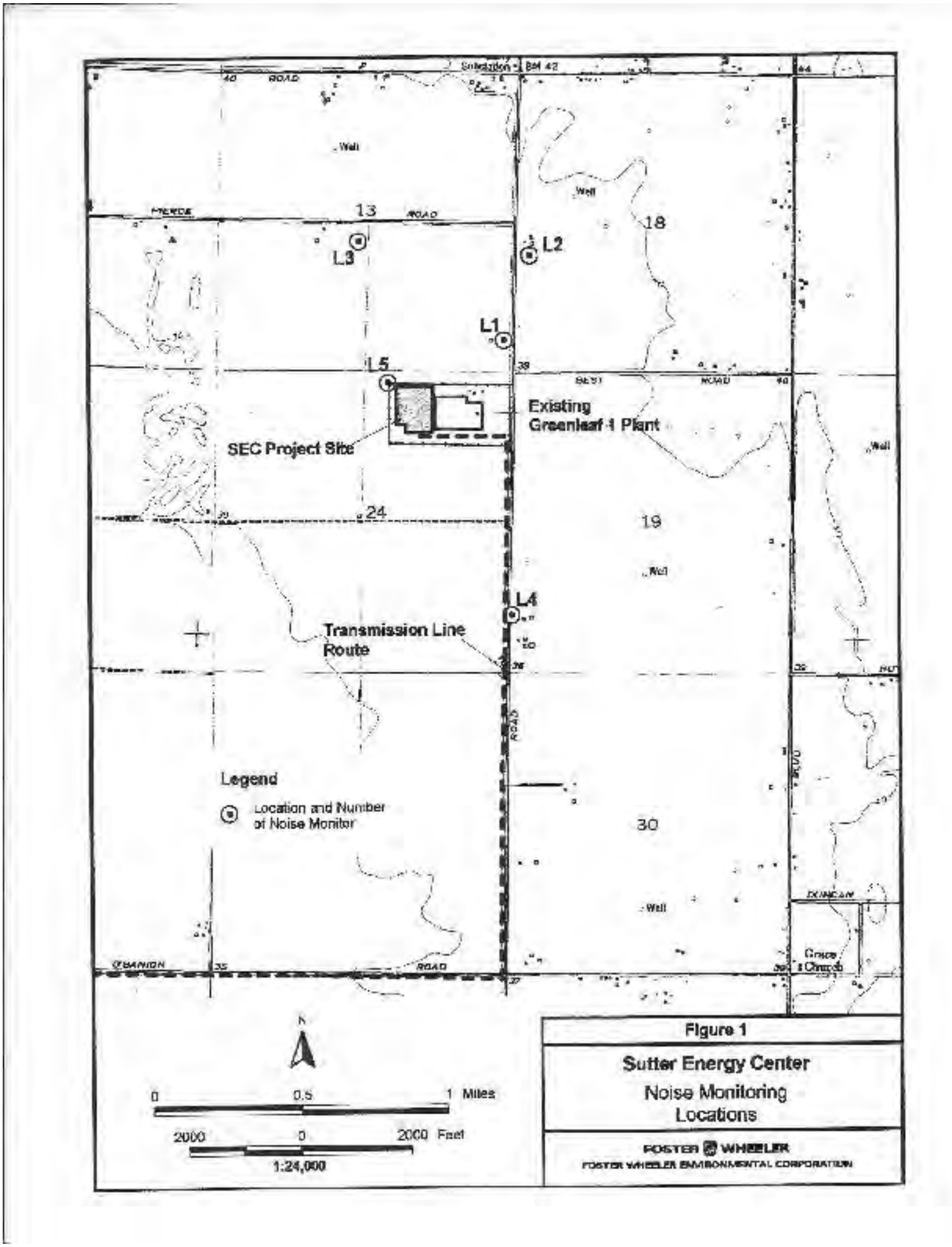


Figure 4.1: Sutter Ag Station Weather Data, 11/14/11

WeatherLink 5.7.1 11/29/11 4:35p: Sutter Ag. - [Browse Records]

File Setup Reports Browse Window Help

Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	Bar	Rain	Rain Rate	Heat D-D	Cool D-D	In Temp	In Hum	I
11/14/11	12:00a	57.2	57.2	56.5	73	48.6	7.0	E	3.50	13.0	E	55.8	56.6	55.2	29.913	0.00	0.00	0.162	0.000	67.9	43	44
11/14/11	12:30a	56.9	57.2	56.8	74	48.7	8.0	E	4.00	14.0	NE	54.8	56.3	54.2	29.900	0.00	0.00	0.169	0.000	67.9	43	44
11/14/11	1:00a	56.4	56.9	56.4	76	48.9	6.0	E	3.00	12.0	E	55.3	55.9	54.8	29.910	0.00	0.00	0.179	0.000	67.7	43	44
11/14/11	1:30a	55.2	56.4	55.2	79	48.8	5.0	E	2.50	9.0	E	54.3	54.9	54.0	29.913	0.00	0.00	0.204	0.000	67.5	43	44
11/14/11	2:00a	54.3	55.2	54.3	80	48.3	4.0	ESE	2.00	7.0	E	53.8	54.0	53.5	29.916	0.00	0.00	0.223	0.000	67.5	43	44
11/14/11	2:30a	54.0	54.3	53.9	80	48.0	4.0	ESE	2.00	7.0	SE	53.5	53.7	53.2	29.924	0.00	0.00	0.229	0.000	67.5	43	44
11/14/11	3:00a	54.2	54.2	54.0	80	48.2	5.0	ESE	2.50	12.0	SE	53.1	53.9	52.8	29.926	0.00	0.00	0.225	0.000	67.5	43	44
11/14/11	3:30a	53.9	54.2	53.9	81	48.2	2.0	SE	1.00	11.0	SE	53.9	53.6	53.6	29.923	0.00	0.00	0.231	0.000	67.4	43	44
11/14/11	4:00a	53.4	53.9	53.4	82	48.0	0.0	---	0.00	0.0	---	53.4	53.2	53.2	29.926	0.00	0.00	0.242	0.000	67.4	42	43
11/14/11	4:30a	52.6	53.4	52.6	83	47.6	0.0	---	0.00	0.0	---	52.6	52.5	52.5	29.933	0.00	0.00	0.258	0.000	69.4	43	45
11/14/11	5:00a	51.8	52.6	51.8	84	47.1	0.0	---	0.00	0.0	---	51.8	51.8	51.8	29.939	0.00	0.00	0.275	0.000	70.9	42	46
11/14/11	5:30a	51.4	51.8	51.4	86	47.4	0.0	E	0.00	3.0	E	51.4	51.4	51.4	29.946	0.00	0.00	0.283	0.000	70.4	42	46
11/14/11	6:00a	50.7	51.4	50.7	87	47.0	0.0	---	0.00	0.0	---	50.7	50.8	50.8	29.958	0.00	0.00	0.298	0.000	71.4	42	47
11/14/11	6:30a	50.3	50.7	50.3	88	46.9	0.0	---	0.00	0.0	---	50.3	50.5	50.5	29.969	0.00	0.00	0.306	0.000	70.6	42	46
11/14/11	7:00a	50.4	50.5	50.3	89	47.3	0.0	---	0.00	0.0	---	50.4	50.6	50.6	29.970	0.00	0.00	0.304	0.000	71.6	42	47
11/14/11	7:30a	50.7	50.7	50.4	90	47.9	0.0	---	0.00	0.0	---	50.7	50.9	50.9	29.989	0.00	0.00	0.298	0.000	71.1	42	46
11/14/11	8:00a	52.1	52.1	50.7	89	49.0	0.0	---	0.00	0.0	---	52.1	52.2	52.2	30.008	0.00	0.00	0.269	0.000	70.4	42	46
11/14/11	8:30a	53.1	53.1	52.1	86	49.0	0.0	NW	0.00	4.0	NW	53.1	53.0	53.0	30.011	0.00	0.00	0.248	0.000	70.4	42	46
11/14/11	9:00a	55.3	55.3	53.1	82	49.9	0.0	NW	0.00	5.0	NNW	55.3	55.1	55.1	30.011	0.00	0.00	0.202	0.000	70.4	43	46
11/14/11	9:30a	57.3	57.3	55.3	77	50.1	1.0	NW	0.50	6.0	NW	57.3	56.9	56.9	30.013	0.00	0.00	0.160	0.000	71.1	43	47
11/14/11	10:00a	59.0	59.0	57.3	74	50.7	3.0	NW	1.50	10.0	WNW	59.0	58.5	58.5	30.013	0.00	0.00	0.125	0.000	73.6	43	49
11/14/11	10:30a	60.8	60.8	59.0	71	51.3	3.0	NW	1.50	10.0	NW	60.8	60.3	60.3	30.008	0.00	0.00	0.088	0.000	73.5	42	49
11/14/11	11:00a	61.3	61.3	60.7	69	51.0	5.0	WNW	2.50	12.0	NW	61.3	60.7	60.7	30.002	0.00	0.00	0.077	0.000	73.1	43	49
11/14/11	11:30a	62.5	62.7	61.2	66	51.0	4.0	WNW	2.00	10.0	WNW	62.5	61.9	61.9	29.995	0.00	0.00	0.052	0.000	73.0	43	49
11/14/11	12:00p	62.9	62.9	62.3	65	51.0	6.0	WNW	3.00	14.0	W	62.9	62.3	62.3	29.980	0.00	0.00	0.044	0.000	73.0	44	49
11/14/11	12:30p	63.7	63.7	62.9	62	50.4	7.0	WNW	3.50	15.0	WNW	63.7	62.9	62.9	29.966	0.00	0.00	0.027	0.000	72.8	44	49
11/14/11	1:00p	64.7	64.7	63.6	61	50.9	6.0	NW	3.00	15.0	W	64.7	64.0	64.0	29.956	0.00	0.00	0.006	0.000	72.8	44	49
11/14/11	1:30p	64.8	64.9	64.4	60	50.6	8.0	WNW	4.00	17.0	WNW	64.2	64.0	63.4	29.949	0.00	0.00	0.004	0.000	72.6	44	49
11/14/11	2:00p	65.7	65.7	64.7	59	51.0	6.0	NW	3.00	14.0	NW	65.7	64.9	64.9	29.947	0.00	0.00	0.000	0.015	72.4	44	49
11/14/11	2:30p	66.4	66.4	65.7	56	50.2	5.0	WNW	2.50	12.0	WNW	66.4	65.5	65.5	29.940	0.00	0.00	0.000	0.029	72.4	44	49
11/14/11	3:00p	66.1	66.5	66.0	56	49.9	6.0	WNW	3.00	15.0	WNW	66.1	65.1	65.1	29.936	0.00	0.00	0.000	0.023	72.4	43	48
11/14/11	3:30p	66.4	66.5	66.1	56	50.2	4.0	WNW	2.00	11.0	WNW	66.4	65.5	65.5	29.937	0.00	0.00	0.000	0.029	73.0	44	49
11/14/11	4:00p	65.6	66.3	65.6	56	49.5	5.0	WNW	2.50	13.0	W	65.6	64.5	64.5	29.931	0.00	0.00	0.000	0.012	73.3	44	50
11/14/11	4:30p	65.1	65.6	65.1	58	50.0	1.0	NW	0.50	7.0	WNW	65.1	64.1	64.1	29.928	0.00	0.00	0.000	0.002	73.3	44	50
11/14/11	5:00p	63.9	65.2	63.9	60	49.7	0.0	NW	0.00	5.0	NW	63.9	63.0	63.0	29.937	0.00	0.00	0.023	0.000	73.5	44	50
11/14/11	5:30p	62.5	63.9	62.5	63	49.7	0.0	---	0.00	0.0	---	62.5	61.7	61.7	29.939	0.00	0.00	0.052	0.000	73.5	44	50
11/14/11	6:00p	60.5	62.5	60.5	68	49.9	0.0	---	0.00	0.0	---	60.5	59.8	59.8	29.954	0.00	0.00	0.094	0.000	73.1	44	49
11/14/11	6:30p	59.0	60.5	59.0	71	49.6	0.0	---	0.00	0.0	---	59.0	58.3	58.3	29.951	0.00	0.00	0.125	0.000	72.8	44	49
11/14/11	7:00p	56.7	59.0	56.7	75	48.9	0.0	---	0.00	0.0	---	56.7	56.2	56.2	29.960	0.00	0.00	0.173	0.000	72.6	43	48
11/14/11	7:30p	55.2	56.7	55.2	77	48.1	0.0	---	0.00	0.0	---	55.2	54.8	54.8	29.962	0.00	0.00	0.204	0.000	72.3	43	48
11/14/11	8:00p	53.6	55.2	53.6	81	47.9	0.0	---	0.00	0.0	---	53.6	53.3	53.3	29.972	0.00	0.00	0.238	0.000	72.1	43	48
11/14/11	8:30p	52.1	53.6	52.1	85	47.7	0.0	---	0.00	0.0	---	52.1	52.1	52.1	29.978	0.00	0.00	0.269	0.000	71.8	43	48
11/14/11	9:00p	51.2	52.1	51.2	85	46.8	0.0	---	0.00	0.0	---	51.2	51.2	51.2	29.990	0.00	0.00	0.287	0.000	71.4	43	47
11/14/11	9:30p	50.4	51.2	50.4	87	46.7	0.0	---	0.00	0.0	---	50.4	50.5	50.5	29.989	0.00	0.00	0.304	0.000	71.2	43	47
11/14/11	10:00p	49.9	50.4	49.9	89	46.8	0.0	---	0.00	0.0	---	49.9	50.2	50.2	29.998	0.00	0.00	0.315	0.000	70.9	42	46
11/14/11	10:30p	49.3	49.9	49.3	89	46.2	0.0	---	0.00	0.0	---	49.3	49.6	49.6	30.006	0.00	0.00	0.327	0.000	70.7	42	46
11/14/11	11:00p	48.8	49.3	48.8	90	46.0	0.0	---	0.00	0.0	---	48.8	49.1	49.1	30.009	0.00	0.00	0.338	0.000	70.6	42	46

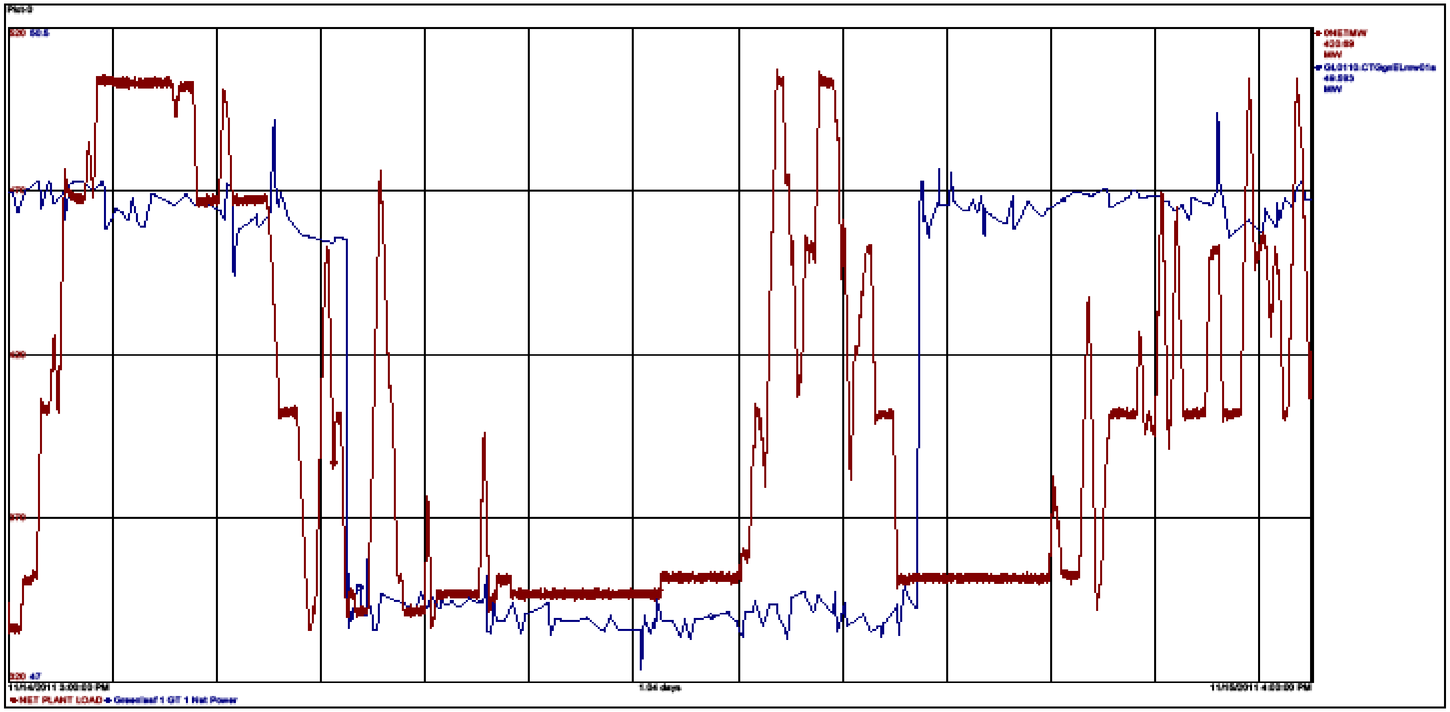
Figure 4.2: Sutter Ag Station Weather Data, 11/15/11

WeatherLink 5.7.1 11/29/11 4:36p: Sutter Ag. - [Browse Records]

File Setup Reports Browse Window Help

Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	Bar	Rain	Rain Rate	Heat D-D	Cool D-D	In Temp	In Hum
11/15/11	12:00a	48.1	48.6	48.1	90	45.3	0.0	---	0.00	0.0	---	48.1	48.3	48.3	30.019	0.00	0.00	0.352	0.000	70.1	42
11/15/11	12:30a	47.6	48.1	47.6	90	44.8	0.0	---	0.00	0.0	---	47.6	47.8	47.8	30.017	0.00	0.00	0.363	0.000	69.7	42
11/15/11	1:00a	47.2	47.6	47.2	91	44.7	0.0	NW	0.00	2.0	NW	47.2	47.4	47.4	30.017	0.00	0.00	0.371	0.000	69.6	42
11/15/11	1:30a	47.0	47.2	47.0	91	44.5	0.0	---	0.00	0.0	---	47.0	47.2	47.2	30.025	0.00	0.00	0.375	0.000	69.4	42
11/15/11	2:00a	46.4	47.0	46.4	91	43.9	0.0	---	0.00	0.0	---	46.4	46.6	46.6	30.029	0.00	0.00	0.387	0.000	69.0	42
11/15/11	2:30a	45.8	46.4	45.8	91	43.3	0.0	---	0.00	0.0	---	45.8	45.9	45.9	30.042	0.00	0.00	0.400	0.000	68.9	42
11/15/11	3:00a	45.3	45.8	45.3	91	42.8	0.0	---	0.00	0.0	---	45.3	45.4	45.4	30.054	0.00	0.00	0.410	0.000	68.7	42
11/15/11	3:30a	45.1	45.3	45.1	92	42.9	0.0	---	0.00	0.0	---	45.1	45.2	45.2	30.055	0.00	0.00	0.415	0.000	68.5	42
11/15/11	4:00a	44.9	45.1	44.9	92	42.7	0.0	---	0.00	0.0	---	44.9	45.0	45.0	30.063	0.00	0.00	0.419	0.000	68.4	41
11/15/11	4:30a	44.7	44.9	44.7	93	42.8	0.0	---	0.00	0.0	---	44.7	44.9	44.9	30.068	0.00	0.00	0.423	0.000	70.1	41
11/15/11	5:00a	44.5	44.7	44.5	93	42.6	0.0	---	0.00	0.0	---	44.5	44.7	44.7	30.073	0.00	0.00	0.427	0.000	70.7	40
11/15/11	5:30a	44.4	44.5	44.4	93	42.5	0.0	---	0.00	0.0	---	44.4	44.6	44.6	30.081	0.00	0.00	0.429	0.000	70.6	40
11/15/11	6:00a	43.9	44.4	43.9	93	42.0	0.0	---	0.00	0.0	---	43.9	44.1	44.1	30.087	0.00	0.00	0.440	0.000	71.1	39
11/15/11	6:30a	43.5	44.0	43.5	93	41.6	0.0	---	0.00	0.0	---	43.5	43.6	43.6	30.106	0.01	0.00	0.448	0.000	70.4	39
11/15/11	7:00a	43.4	43.5	43.4	93	41.5	0.0	---	0.00	0.0	---	43.4	43.5	43.5	30.117	0.00	0.00	0.450	0.000	71.4	39
11/15/11	7:30a	44.1	44.1	43.4	94	42.5	0.0	---	0.00	0.0	---	44.1	44.3	44.3	30.126	0.00	0.00	0.435	0.000	70.7	39
11/15/11	8:00a	46.5	46.5	44.1	95	45.1	0.0	---	0.00	0.0	---	46.5	46.8	46.8	30.140	0.00	0.00	0.385	0.000	70.2	39
11/15/11	8:30a	50.5	50.5	46.6	90	47.7	0.0	---	0.00	0.0	---	50.5	50.8	50.8	30.155	0.00	0.00	0.302	0.000	70.4	40
11/15/11	9:00a	53.9	53.9	50.6	77	46.9	0.0	---	0.00	0.0	---	53.9	53.5	53.5	30.157	0.00	0.00	0.231	0.000	70.6	41
11/15/11	9:30a	55.5	55.5	53.9	77	48.4	0.0	NW	0.00	1.0	NW	55.5	55.1	55.1	30.161	0.00	0.00	0.198	0.000	70.7	41
11/15/11	10:00a	56.0	56.0	55.5	77	48.9	0.0	NW	0.00	4.0	NW	56.0	55.5	55.5	30.161	0.00	0.00	0.188	0.000	70.7	42
11/15/11	10:30a	57.0	57.2	56.0	76	49.5	0.0	NW	0.00	7.0	NW	57.0	56.5	56.5	30.160	0.00	0.00	0.167	0.000	70.7	42
11/15/11	11:00a	58.4	58.4	56.9	73	49.8	0.0	NW	0.00	4.0	WNW	58.4	57.8	57.8	30.147	0.00	0.00	0.137	0.000	72.1	42
11/15/11	11:30a	59.0	59.3	58.3	73	50.4	1.0	WNW	0.50	6.0	WNW	59.0	58.4	58.4	30.137	0.00	0.00	0.125	0.000	75.0	41
11/15/11	12:00p	59.5	59.5	59.0	71	50.1	3.0	WNW	1.50	7.0	WNW	59.5	58.9	58.9	30.125	0.00	0.00	0.115	0.000	74.9	41
11/15/11	12:30p	60.9	61.0	59.5	66	49.5	3.0	WNW	1.50	7.0	WNW	60.9	60.1	60.1	30.118	0.00	0.00	0.085	0.000	74.3	42
11/15/11	1:00p	62.2	62.2	60.9	62	49.0	3.0	WNW	1.50	10.0	WNW	62.2	61.2	61.2	30.103	0.00	0.00	0.058	0.000	74.0	42
11/15/11	1:30p	63.4	63.6	62.2	60	49.3	3.0	WNW	1.50	9.0	WNW	63.4	62.4	62.4	30.095	0.00	0.00	0.033	0.000	73.3	42
11/15/11	2:00p	63.6	63.8	63.2	58	48.5	4.0	NW	2.00	10.0	NW	63.6	62.5	62.5	30.091	0.00	0.00	0.029	0.000	73.0	42
11/15/11	2:30p	63.5	63.8	63.3	54	46.6	3.0	WNW	1.50	9.0	NW	63.5	62.0	62.0	30.084	0.00	0.00	0.031	0.000	72.8	40
11/15/11	3:00p	64.3	64.3	63.4	50	45.3	3.0	WNW	1.50	9.0	WNW	64.3	62.5	62.5	30.076	0.00	0.00	0.015	0.000	72.4	39
11/15/11	3:30p	65.2	65.2	64.2	47	44.5	2.0	WNW	1.00	7.0	WNW	65.2	63.2	63.2	30.072	0.00	0.00	0.000	0.004	72.3	39
11/15/11	4:00p	65.2	65.5	65.2	47	44.5	0.0	WNW	0.00	3.0	WNW	65.2	63.2	63.2	30.071	0.00	0.00	0.000	0.004	73.1	40
11/15/11	4:30p	64.1	65.2	64.1	49	44.5	0.0	---	0.00	0.0	---	64.1	62.2	62.2	30.068	0.00	0.00	0.019	0.000	73.5	41
11/15/11	5:00p	63.6	64.2	63.6	52	45.6	0.0	---	0.00	0.0	---	63.6	62.0	62.0	30.070	0.00	0.00	0.029	0.000	73.6	41
11/15/11	5:30p	61.3	63.6	61.3	56	45.5	0.0	---	0.00	0.0	---	61.3	59.8	59.8	30.070	0.00	0.00	0.077	0.000	73.6	41
11/15/11	6:00p	58.4	61.3	58.4	64	46.3	0.0	---	0.00	0.0	---	58.4	57.3	57.3	30.073	0.00	0.00	0.137	0.000	73.5	41
11/15/11	6:30p	56.3	58.3	56.3	69	46.3	0.0	---	0.00	0.0	---	56.3	55.5	55.5	30.080	0.00	0.00	0.181	0.000	73.5	42
11/15/11	7:00p	55.0	56.3	55.0	70	45.4	0.0	---	0.00	0.0	---	55.0	54.2	54.2	30.081	0.00	0.00	0.208	0.000	73.1	42
11/15/11	7:30p	53.8	55.0	53.8	74	45.7	0.0	---	0.00	0.0	---	53.8	53.3	53.3	30.086	0.00	0.00	0.233	0.000	72.8	42
11/15/11	8:00p	53.0	53.8	53.0	76	45.6	0.0	---	0.00	0.0	---	53.0	52.5	52.5	30.086	0.00	0.00	0.250	0.000	72.4	41
11/15/11	8:30p	52.6	53.0	52.6	77	45.6	0.0	---	0.00	0.0	---	52.6	52.2	52.2	30.092	0.00	0.00	0.258	0.000	72.1	41
11/15/11	9:00p	51.7	52.6	51.7	79	45.4	0.0	---	0.00	0.0	---	51.7	51.5	51.5	30.101	0.00	0.00	0.277	0.000	71.9	41
11/15/11	9:30p	50.8	51.7	50.8	81	45.2	0.0	---	0.00	0.0	---	50.8	50.7	50.7	30.107	0.00	0.00	0.296	0.000	71.6	41
11/15/11	10:00p	49.9	50.8	49.9	84	45.3	0.0	---	0.00	0.0	---	49.9	50.0	50.0	30.103	0.00	0.00	0.315	0.000	71.4	41
11/15/11	10:30p	49.4	49.9	49.4	86	45.4	0.0	---	0.00	0.0	---	49.4	49.5	49.5	30.103	0.00	0.00	0.325	0.000	71.1	41
11/15/11	11:00p	48.9	49.4	48.9	88	45.5	0.0	---	0.00	0.0	---	48.9	49.1	49.1	30.100	0.00	0.00	0.335	0.000	70.9	41

Figure 5.1: Run Plot for Sutter Energy Center and Greenleaf 1, 11/14/11 – 11/15/11



Appendix 3.8A
Health Risk Assessment Support Data

Appendix 3.8
Health Risk Assessment Support Data

Health Risk Assessment Process, Goals, Assumptions, and Uses

"In recent years, the public has become increasingly aware of the presence of harmful chemicals in our environment. Many people express concerns about pesticides and other foreign substances in food, contaminants in drinking water, and toxic pollutants in the air. Others believe these concerns are exaggerated or unwarranted. How can we determine which of these potential hazards really deserve attention? How do we, as a society, decide where to focus our efforts and resources to control these hazards? When we hear about toxic threats that affect us personally, such as the discovery of industrial waste buried in our neighborhood or near our children's school, how concerned should we be?

Health risk assessment is a scientific tool designed to help answer these questions. Government agencies rely on risk assessments to help them determine which potential hazards are the most significant. Risk assessments can also guide regulators in abating environmental hazards. Members of the public who learn the basics of risk assessment can improve their understanding of both real and perceived environmental hazards, and they can work more effectively with decision makers on solutions to environmental problems.

Chemicals can be either beneficial or harmful, depending on a number of factors, such as the amounts to which we are exposed. Low levels of some substances may be necessary for good health, but higher levels may be harmful. Health risk assessments are used to determine if a particular chemical poses a significant risk to human health and, if so, under what circumstances. Could exposure to a specific chemical cause significant health problems? How much of the chemical would someone have to be exposed to before it would be dangerous? How serious could the health risks be? What activities might put people at increased risk?

If it were possible to prevent all human exposure to all hazardous chemicals, there would be no need for risk assessment. However, the total removal of harmful pollutants from the environment is often infeasible or impossible, and many naturally occurring substances also pose health risks. Risk assessment helps scientists and regulators identify serious health hazards and determine realistic goals for reducing exposure to toxics so that there is no significant health threat to the public.

Estimating the hazards posed by toxic chemicals in the environment involves the compilation and evaluation of complex sets of data. Government regulators, therefore, turn to specialists to perform or assist with risk assessments. These specialists include scientists with degrees in toxicology (the study of the toxic effects of chemicals) and epidemiology (the study of disease or illness in populations) as well as physicians, biologists, chemists, and engineers.

The term "health risk assessment" is often misinterpreted. People sometimes think that a risk assessment will tell them whether a current health problem or symptom was caused by exposure to a chemical. This is not the case. Scientists who are searching for links between chemical exposures and health problems in a community may conduct an epidemiologic study. These studies typically include a survey of health problems in a community and a comparison of health problems in that community with those in other cities, communities, or the population as a whole.

Although they are both important, health risk assessments and epidemiologic studies have different objectives. Most epidemiologic studies evaluate whether *past* chemical exposures may be responsible for documented health problems in a specific group of people. In contrast, health risk assessments are used to estimate whether current or future chemical exposures will pose health risks to a broad population, such as a city or a community. Scientific methods used in health risk assessment cannot be used to link individual illnesses to past chemical exposures, nor can health risk assessments and epidemiologic studies prove that a specific toxic substance caused an individual's illness.

The U.S. Environmental Protection Agency (U.S. EPA) is a leading risk assessment agency at the federal level. In California, the Office of Environmental Health Hazard Assessment (OEHHA) in the California Environmental Protection Agency (Cal/EPA) has the primary responsibility for developing procedures and practices for performing health risk assessments. Other agencies within Cal/EPA, such as the Department of Pesticide Regulation and the Department of Toxic Substances Control, have extensive risk assessment programs of their own but work closely with OEHHA.

The Department of Pesticide Regulation uses risk assessments to make regulatory decisions concerning safe pesticide uses. The Department of Toxic Substances Control uses risk assessments to determine requirements for the management and cleanup of hazardous wastes. OEHHA's health risk assessments are used by the Air Resources Board to develop regulations governing toxic air contaminants, and by the Department of Health Services to develop California's drinking water standards. These agencies' decisions take into account the seriousness of potential health effects along with the economic and technical feasibility of measures that can reduce the health risks.

Health risk assessment requires both sound science and professional judgment and is a constantly developing process. Cal/EPA is nationally recognized for developing new procedures that improve the accuracy of risk assessments. Cal/EPA also works closely with U.S. EPA in all phases of risk assessment.

The risk assessment process is typically described as consisting of four basic steps: hazard identification, exposure assessment, dose-response assessment, and risk characterization. Each of these steps will be explained in the following text.

Hazard Identification

In the first step, hazard identification, scientists determine the types of health problems a chemical could cause by reviewing studies of its effects in humans and laboratory animals. Depending on the chemical, these health effects may include short-term ailments, such as headaches; nausea; and eye, nose, and throat irritation; or chronic diseases, such as cancer. Effects on sensitive populations, such as pregnant women and their developing fetuses, the elderly, or those with health problems (including those with weakened immune systems), must also be considered. Responses to toxic chemicals will vary depending on the amount and length of exposure. For example, short-term exposure to low concentrations of chemicals may produce no noticeable effect, but continued exposure to the same levels of chemicals over a long period of time may eventually cause harm. An important step in hazard identification is the selection of key research studies that can provide accurate, timely information on the hazards posed to humans by a particular chemical. The selection of a study is based upon factors such as whether the study has been peer reviewed by qualified scientists, whether the study's findings have been verified by other studies, and the species tested (human studies provide the best evidence). Some studies may involve humans that have been exposed to the chemical, while others may involve studies with laboratory animals.

Human data frequently are useful in evaluating human health risks associated with chemical exposures. Human epidemiologic studies typically examine the effects of chemical exposure on a large number of people, such as employees exposed to varying concentrations of chemicals in the workplace. In many cases, these exposures took place prior to the introduction of modern worker-safety measures.

One weakness of occupational studies is that they generally measure the effects of chemicals on healthy workers and do not consider children, the elderly, those with pre-existing medical conditions, or other sensitive groups. Since occupational studies are not controlled experiments, there may be uncertainties about the amount and duration of exposure or the influence of lifestyle choices, such as smoking or alcohol use, on the health of workers in the studies. Exposure of workers to other chemicals at the same time may also influence and complicate the results.

Laboratory studies using human volunteers are better able to gauge some health effects because chemical exposures can then be measured with precision. But these studies usually involve small numbers of people and, in conformance with ethical and legal requirements, use only adults who agree to participate in the studies. Moreover, laboratory studies often use simple measurements that identify immediate responses to the chemical but might miss significant, longer-term health effects. Scientists can also use physicians' case reports of an industrial or transportation accident in which individuals were unintentionally exposed to a chemical. However, these reports may involve very small numbers of people, and the level of exposure to the chemical could be greater than exposures to the same chemical in the environment. Nevertheless, human studies are preferred for risk assessment, so OEHHA makes every effort to use them when they are available.

Because the effects of the vast majority of chemicals have not been studied in humans, scientists must often rely on animal studies to evaluate a chemical's health effects. Animal studies have the advantage of being performed under controlled laboratory conditions that reduce much of the uncertainty related to human studies. If animal studies are used, scientists must determine whether a chemical's health effects in humans are likely to be similar to those in the animals tested. Although effects seen in animals can also occur in humans, there may be subtle or even significant differences in the ways humans and experimental animals react to a chemical. Comparison of human and animal metabolism may be useful in selecting the animal species that should be studied, but it is often not possible to determine which species is most like humans in its response to a chemical exposure. However, if similar effects were found in more than one species, the results would strengthen the evidence that humans may also be at risk.

Exposure Assessment

In exposure assessment, scientists attempt to determine how long people were exposed to a chemical; how much of the chemical they were exposed to; whether the exposure was continuous or intermittent; and how people were exposed—through eating, drinking water and other liquids, breathing, or skin contact. All of this information is combined with factors such as breathing rates, water consumption, and daily activity patterns to estimate how much of the chemical was taken into the bodies of those exposed.

People can be exposed to toxic chemicals in various ways. These substances can be present in the air we breathe, the food we eat, or the water we drink. Some chemicals, due to their particular characteristics, may be both inhaled and ingested. For example, airborne chemicals can settle on the surface of water, soil, leaves, fruits, vegetables, and forage crops used as animal feed. Cows, chickens, or other livestock can become contaminated when eating, drinking, or breathing the chemicals present in the air, water, feed, and soil. Fish can absorb the chemicals as they swim in contaminated water or ingest contaminated food. Chemicals can be absorbed through the skin, so infants and children can be exposed simply by crawling or playing in contaminated dirt. They can also ingest chemicals if they put their fingers or toys in their mouths after playing in contaminated dirt. Chemicals can also be passed on from nursing mothers to their children through breast milk.

To estimate exposure levels, scientists rely on air, water, and soil monitoring; human blood and urine samples; or computer modeling. Although monitoring of a pollutant provides excellent data, it is time consuming, costly, and typically limited to only a few locations. For those reasons, scientists often rely on computer modeling, which uses mathematical equations to describe how a chemical is released and to estimate the speed and direction of its movement through the surrounding environment. Modeling has the advantage of being relatively inexpensive and less time consuming, provided all necessary information is available and the accuracy of the model can be verified through testing.

Computer modeling is often used to assess chemical releases from industrial facilities. Such models require information on the type of chemicals released, facilities' hours of operation, industrial processes that release the chemicals, smokestack height and temperature, any pollution-control equipment that is used, surrounding land type (urban or rural), local topography and meteorology, and census data regarding the exposed population.

In all health risk assessments, scientists must make assumptions in order to estimate human exposure to a chemical. For example, scientists assessing the effects of air pollution may need to make assumptions about the time people spend outdoors, where they are more directly exposed to pollutants in the ambient air, or the time they spend in an area where the pollution is greatest. An assessment of soil contamination may require scientists to make assumptions about people's consumption of fruits and vegetables that may absorb soil contaminants.

To avoid underestimating actual human exposure to a chemical, scientists often look at the range of possible exposures. For example, people who jog in the afternoon, when urban air pollution levels are highest, would have much higher exposures to air pollutants than people who come home after work and relax indoors. Basing an exposure estimate on a value near the higher end of a range of exposure levels (closer to the levels experienced by the jogger than by the person remaining indoors) provides a realistic worst-case estimate of exposure. These kinds of conservative assumptions, which presume that people are exposed to the highest amounts of a chemical that can be considered credible, are referred to as "health-protective" assumptions.

Dose-Response Assessment

In dose-response assessment, scientists evaluate the information obtained during the hazard identification step to estimate the amount of a chemical that is likely to result in a particular health effect in humans.

An established principle in toxicology is that "the dose makes the poison." For example, a commonplace chemical like table salt is harmless in small quantities, but it can cause illness in large doses. Similarly, hydrochloric acid, a hazardous chemical, is produced naturally in our stomachs but can be quite harmful if taken in large doses.

Scientists perform a dose-response assessment to estimate how different levels of exposure to a chemical can impact the likelihood and severity of health effects. The dose-response relationship is often different for many chemicals that cause cancer than it is for those that cause other kinds of health problems.

Cancer Effects

For chemicals that cause cancer, the general assumption in risk assessment has been that there are no exposures that have "zero risk" unless there is clear evidence otherwise. In other words, even a very low exposure to a cancer-causing chemical may result in cancer if the chemical happens to alter cellular functions in a way that causes cancer to develop. Thus, even very low exposures to carcinogens might increase the risk of cancer, if only by a very small amount.

Several factors make it difficult to estimate the risk of cancer. Cancer appears to be a progressive disease because a series of cellular transformations is thought to occur before cancer develops. In addition, cancer in humans often develops many years after exposure to a chemical. Also, the best information available on the ability of chemicals to cause cancer often comes from studies in which a limited number of laboratory animals are exposed to levels of chemicals that are much higher than the levels humans would normally be exposed to in the environment. As a result, scientists use mathematical models based on studies of animals exposed to high levels of a chemical to estimate the probability of cancer developing in a diverse population of humans exposed to much lower levels. The uncertainty in these estimates may be rather large. To reduce these uncertainties, risk assessors must stay informed of new scientific research. Data from new studies can be used to improve estimates of cancer risks.

Non-cancer Effects

Non-cancer health effects (such as asthma, nervous system disorders, birth defects, and developmental problems in children) typically become more severe as exposure to a chemical increases. One goal of dose-response assessment is to estimate levels of exposure that pose only a low or negligible risk for non-cancer health effects. Scientists analyze studies of the health effects of a chemical to develop this estimate. They take into account such factors as the quality of the scientific studies, whether humans or laboratory animals were studied, and the degree to which some people may be more sensitive to the chemical than others. The estimated level of exposure that poses no significant health risks can be reduced to reflect these factors.

Risk Characterization

The last step in risk assessment brings together the information developed in the previous three steps to estimate the risk of health effects in an exposed population. In the risk characterization step, scientists analyze the information developed during the exposure and dose-response assessments to describe the resulting health risks that are expected to occur in the exposed population. This information is presented in different ways for cancer and non-cancer health effects, as explained below.

Cancer Risk

Cancer risk is often expressed as the maximum number of new cases of cancer projected to occur in a population of one million people due to exposure to the cancer-causing substance over a 70-year lifetime. For example, a cancer risk of one in one million means that in a population of one million people, not more than one additional person would be expected to develop cancer as the result of the exposure to the substance causing that risk.

An individual's actual risk of contracting cancer from exposure to a chemical is often less than the theoretical risk to the entire population calculated in the risk assessment. For example, the risk estimate for a drinking-water contaminant may be based on the health-protective assumption that the individual drinks two liters of water from a contaminated source daily over a 70-year lifetime. However, an individual's actual exposure to that contaminant would likely be lower due to a shorter time of residence in the area. Moreover, an individual's risk not only depends on the individual's exposure to a specific chemical but also on his or her genetic background (i.e., a family history of certain types of cancer); health; diet; and lifestyle choices, such as smoking or alcohol consumption.

Cancer risks presented in risk assessments are often compared to the overall risk of cancer in the general U.S. population (about 250,000 cases for every one million people) or to the risk posed by all harmful chemicals in a particular medium, such as the air. The cancer risk from breathing current levels of pollutants in California's ambient air over a 70-year lifetime is estimated to be 760 in one million.

Non-cancer Risk

Non-cancer risk is usually determined by comparing the actual level of exposure to a chemical to the level of exposure that is not expected to cause any adverse effects, even in the most susceptible people. Levels of exposure at which no adverse health effects are expected are called "health reference levels," and they generally are based on the results of animal studies. However, scientists usually set health reference levels much lower than the levels of exposure that were found to have no adverse effects in the animals tested. This approach helps to ensure that real health risks are not underestimated by adjusting for possible differences in a chemical's effects on laboratory animals and humans; the possibility that some humans, such as children and the elderly, may be particularly sensitive to a chemical; and possible deficiencies in data from the animal studies.

Depending on the amount of uncertainty in the data, scientists may set a health reference level 100 to 10,000 times lower than the levels of exposure observed to have no adverse effects in animal studies. Exposures above the health reference level are not necessarily hazardous, but the risk of toxic effects increases as the dose increases. If an assessment determines that human exposure to a chemical exceeds the health reference level, further investigation is warranted.

Risk managers rely on risk assessments when making regulatory decisions, such as setting drinking water standards, or developing plans to clean up hazardous waste sites. Risk managers are responsible for protecting human health, but they must also consider public acceptance, as well as technological, economic, social, and political factors, when arriving at their decisions. For example, they may need to consider how much it would cost to remove a contaminant from drinking water supplies or how seriously the loss of jobs would affect a community if a factory were to close due to the challenge of meeting regulatory requirements that are set at the most stringent level.

Health risk assessments can help risk managers weigh the benefits and costs of various alternatives for reducing exposure to chemicals. For example, a health risk assessment of a hazardous waste site could help determine whether placing a clay cap over the waste to prevent exposure would offer the same health protection as the more costly option of removing the waste from the site.

One of the most difficult questions of risk management is: How much risk is acceptable? While it would be ideal to completely eliminate all exposure to hazardous chemicals, it is usually not possible or feasible to remove all traces of a chemical once it has been released into the environment. The goal of most regulators is to reduce the health risks associated with exposure to hazardous pollutants to a negligibly low level.

Regulators generally presume that a one-in-one million risk of cancer from life-long exposure to a hazardous chemical is an "acceptable risk" level because the risk is extremely low compared to the overall cancer rate. If a drinking water standard for a cancer-causing chemical were set at the level posing a "one-in-one million" risk, it would mean that not more than one additional cancer case (beyond what would normally occur in the population) would potentially occur in a population of one million people drinking water meeting that standard over a 70-year lifetime.

Actual regulatory standards for chemicals or hazardous waste cleanups may be set at less stringent risk levels, such as one in 100,000 (not more than one additional cancer case per 100,000 people) or one in 10,000 (not more than one additional cancer case per 10,000 people). These less stringent risk levels are often due to economic or technological considerations. Regulatory agencies generally view these higher risk levels to be acceptable if there is no feasible way to reduce the risks further."[1]

[1] A Guide to Health Risk Assessment, CalEPA-Office of Environmental Health Hazard Assessment, 2001.

The exposure and dose-response estimates for the project analysis were conducted using HARP (Version 1.4f).

The following tables summarize the results of the HRA performed by the proposed SEC modified facility.

TABLE 3.9-1 CRITERIA AND AIR TOXIC POLLUTANTS EMITTED FROM SEC FACILITY	
NOx	Acetaldehyde
CO	Acrolein
VOC*	Benzene
SOx	Ethylbenzene
PM10/PM2.5	Hexane
1-3 Butadiene	Naphthalene
Formaldehyde	Propylene Oxide
PAHs	Xylenes
Propylene	
Toluene	

Table 3.9-2 Significant Health Effect Threshold Levels

Risk Category	Risk Threshold*
Cancer Risk	>1.0 x 10^{-6} without TBACT >10 x 10^{-6} with TBACT
Chronic Hazard Index	>1.0
Acute Hazard Index	>1.0
Cancer Burden	>1.0

*California standard risk threshold levels.

No specific health related studies prepared by either the local health department or the local air district were identified which pertain to the local project area for any identified toxic air pollutant or identified specific population.

The other assumptions used in running the HARP program were as follows:

- Emission rates for non-criteria pollutants are taken from AFC Section 3.1, and from Appendix 3.1A.
- Number of residents affected is based upon the 2010 population data for those census tracts or portions of census tracts which lie within the maximum impact receptor radius of the proposed facility.
- All receptors were treated as residential receptors, which allows for the assumption that the MIR, if assumed residential, will represent the highest risk and no other receptor will show risks higher than the MIR. This deletes the need for running worker risks. The HARP risk run options as recommended by South Coast AQMD (Chico, 10-20-05) were utilized (i.e., for cancer - 70-year and derived adjusted method; for chronic - 70-year and derived OEHHA method; for acute - no options).
- Based on the previous bullet, the MIR is the highest offsite point of maximum impact (PMI) that cannot be deleted from the HRA analysis due to not meeting the criteria of a receptor than can be inhabited for the entire exposure period, i.e., receptors in roadways, riverbeds, parks, etc., are not considered in the MIR (PMI) receptor selection.
- Deposition velocity is taken to be 0.02 m/s, as recommended by ARB for controlled emission sources.

- Fraction of residents with gardens is taken to be 0.15 which is likely conservatively high for the rural area near the project site.
- Fraction of produce grown at home is taken to be 0.15, which is also likely to be conservatively high for the rural area near the project site.

The HARP program is a tool that assists with the programmatic requirements of the Air Toxics Hot Spots Program, and it can be used for preparing health risk assessments for other related programs such as air toxic control measure development or facility permitting applications. HARP is a computer based risk assessment program which combines the tools of emission inventory database, facility prioritization, air dispersion modeling, and risk assessment analysis. Use of HARP promotes statewide consistency in the area of risk assessment, increases the efficiency of evaluating potential health impacts, and provides a cost effective tool for developing facility health risk assessments. HARP may be used on single sources, facilities with multiple sources, or multiple facilities in close proximity to each other. The receptor grid used in HARP was the same as the grid used in the air quality impact analysis (AERMOD). The AERMOD files used in the HARP analysis were processed via the HARP On-Ramp program.

The HARP program results for acute and chronic inhalation and chronic non-inhalation exposures, cancer burden and individual cancer risk (workplace and residential) for the proposed sources are included in this Appendix (as electronic files on the CD).

The modeling results show that the maximum modeled cancer risk (MIR) from SEC is expected to be $6.71xE^{-6}$. This risk is well below the ten in one million level (with T-BACT), and the state significance value. The chronic and acute non-cancer hazard indices are 0.00903 and 0.00533, respectively (at the cancer MIR location). Both are well below the significant impact level of 1.0. The MIR was located approximately 2,300 feet from the site grid center. The $1x10^{-6}$ isopleth radius occurs at less than 3000 ft from the site. At this radius there are approximately less than 25 individuals impacted, therefore the total cancer burden was calculated to be 0.000025, which is also well below the state threshold value of 1.0. Detailed calculations and results for each significant receptor are included in the modeling results, which are being submitted electronically.

TABLE 3.9-3 HEALTH RISK ASSESSMENT SUMMARY (MIR)		
Stationary Sources Only		
Risk Category	**Facility Values**	**Applicable Significance Threshold**
Cancer Risk	6.71×10^{-6}	See Table 3.9-2
Chronic Hazard Index	0.00903	
Acute Hazard Index	0.00533	
Cancer Burden	0.000025	
Facility MIR location coordinates are: Cancer risk and chronic MIR – #13172, 612820mE, 4323558mN Acute MIR location coordinates are: Acute MIR – #13189, 612897mE, 4323470mN		

The calculated health effects as summarized above do not exceed the state significance threshold values, therefore the health effects would be considered "not significant" and may even be "zero". These results are also provided on the air modeling CD.

The following tables and figures are presented at the end of this appendix:

Table 3.9-4	Sensitive Receptor Listing for the Primary Impact Area
Table 3.9-5	OEHHA/CARB Risk Assessment Health Values
Table 3.9-6	Census Tract Numbers and Population Data
Figure 3.9-1	6-Mile Radius Zone Map
Figure 3.9-2	MIR Location Map

Table 3.9-4. Sensitive Receptors Within the Regional Area of the Project

Receptor ID	Receptor Type	UTM Coordinates (E/N), m	Elevation, Ft (amsl)
1	High School (HS)	607464, 4336057	86
2	Elementary School (ES)	608276, 4335511	69
3	ES	595423, 4325094	42
4	ES	615739, 4318154	38
5	ES	625428, 4317890	42
6	Intermediate School (IS)	625813, 4316904	46
7	ES	625320, 4319059	44
8	ES	628459, 4320893	63
9	ES	624967, 4322369	54
10	ES	625240, 4326266	59
11	HS	626505, 4327032	63
12	ES	625792, 4327535	62
13	ES	625313, 4328095	63
14	ES	625166, 4328292	63
15	Religious School (RS)	619400, 4329018	56
16	Daycare (DC)	616708, 4329321	52
17	ES	618388, 4329544	53
18	ES	617376, 4330016	52
19	Middle School (MS)	617067, 4331327	54
20	RS	618822, 4331398	53
21	HS	618740, 4332009	55
22	Jr. College	616534, 4333157	57

All coordinates from Google Earth (center location of each receptor location).
Based on a ~6-mile radius area search.

Table 3.9-5. CARB/OEHHA Risk Values (May 2012 listing)

Pollutant	Chronic Inhalation REL, ug/m^3	Acute Inhalation REL, ug/m^3	Inhalation Cancer Potency Value, mg/kg-day^{-1}
Acetaldehyde	140	470	0.01
Acrolein	0.35	2.5	n/a
Ammonia	200	3200	n/a
Benzene	60	1300	0.1
1-3 Butadiene	20	n/a	0.6
Ethylbenzene	2000	n/a	0.0087
Formaldehyde	9	55	0.02
Hexane	7000	n/a	n/a

Naphthalene	9	n/a	0.12
PAHs (as BaP)	n/a	n/a	0.39
Propylene	3000	n/a	n/a
Propylene Oxide	30	3100	0.013
Toluene	300	37000	n/a
Xylenes	700	22000	n/a

Table 3.9-6 Census Tract Numbers and Population Data (2010)

Tract Number	Tract Population (2010)
510 (site census tract)	2461
508	3460
509	1561
505.03	6966
505.04	7163
504.02	3970

Figure 3.9-1 6 Mile Radius Zone Map

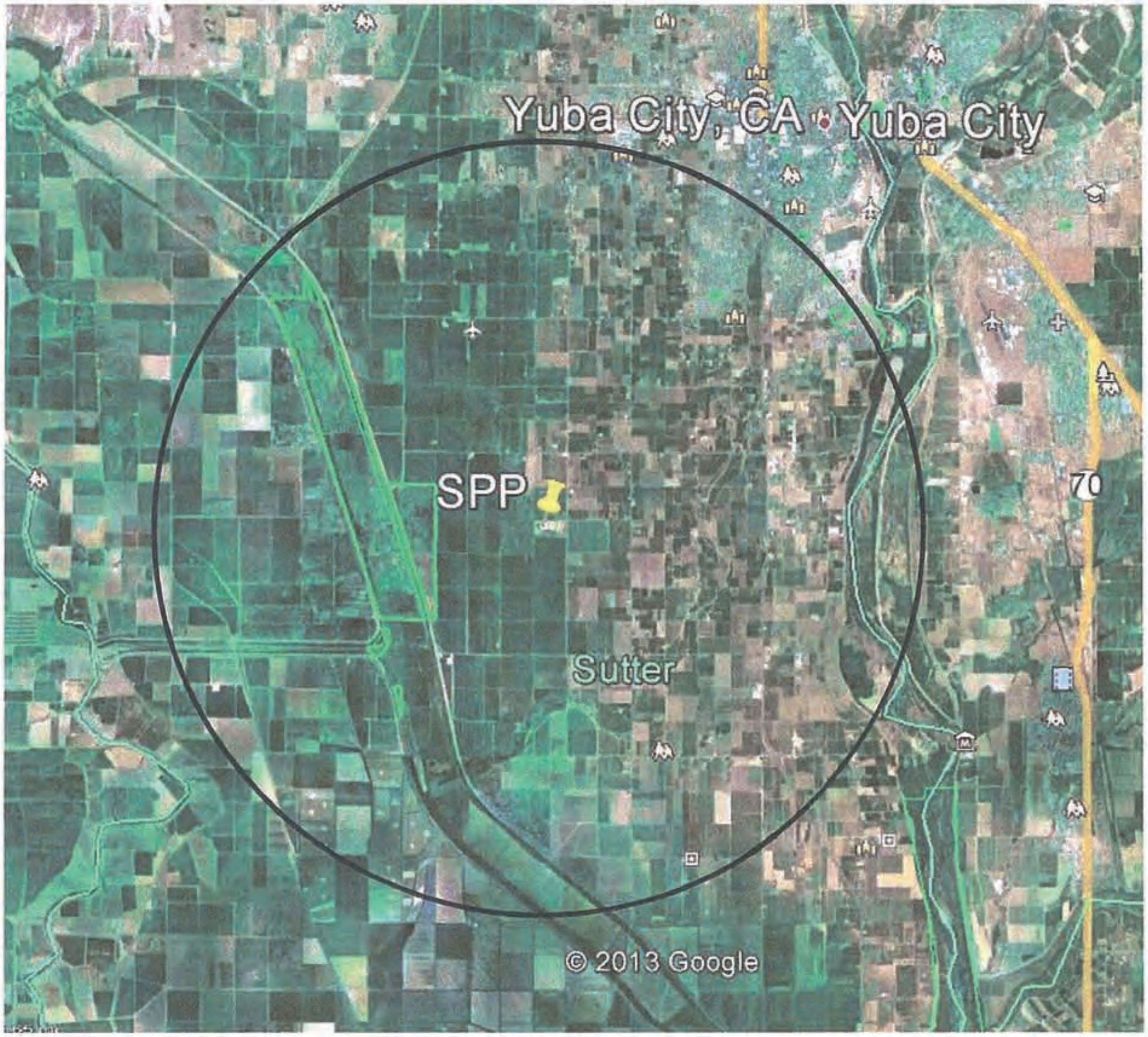


Figure 3.9-2 MIR Location Map

Appendix 3.10A
Soil Loss Calculations

Estimate of Total Suspended Particulates (TSP) Emitted from Grading and Wind Erosion
Sutter Energy Center Petition to Amend #6

Emission Source	Acreage	Duration (months)	Unmitigated TSP (tons)	Mitigated TSP (tons)
Grading Dust:				
Substation	28.0	1	0.48	0.17
Aux Boiler, ACC, and Perimeter Rd Expansion	0.8	1	0.014	0.005
Transmission Line (trench)	1.8	4	0.13	0.04
Wind Blown Dust:				
Substation	28.0	12	1.1	0.37
Aux Boiler, ACC, and Perimeter Rd Expansion	0.1	12	0.024	0.008
Transmission Line Corridor	6.9	2	0.44	0.15
Estimated Total			**2.1**	**0.75**

Project Assumptions:
Grading for the substation site will be completed in 1 month, with construction extending an additional 12 months.
Excavation of the transmission line corridor will take 4 months followed by a 2 month construction period before the re-establishment of vegetation.
Approximately 1/10th of the substation, aux boiler, and acc sites will have bare soil exposure during the length of the construction period.
Approximately 1/2 of the transmission line corridors will have bare soil exposure during the length of the construction period.

Data Sources:
[a] PM10 Emission Factor Source: Midwest Research Institute, South Coast AQMD Project No. 95040, Level 2 Analysis Procedure, March 1996
[b] PM10 to TSP Conversion Factor Source: Bay Area Air Quality Management District CEQA Guidelines, Assessing the Air Quality Impacts of Projects, December 1999.
SCAQMD CEQA Handbook (1993) Table 11-4 for mitigation efficiency rates (as summarized in Table 8.9-4)

Dust from Wind Erosion - With and Without Mitigation
Sutter Energy Center Petition to Amend #6

Grading		MRI factor of 0.011 tons/acre/month is based on 168 hours per month of construction activity.
PM10 Emission Factor (ton/acre/month)[a]	0.011	Fact Sheet, 4/26/2007.
New Substation		
Duration (months):	1	Assumes 1 month of active grading.
Site Acreage:	28.0	
PM10 Emitted (tons):	0.31	
TSP Emitted (tons)[b]:	**0.481**	Assumes TSP is 64% PM10
Mitigated TSP Emitted (tons):	**0.168**	
New Aux Boiler, ACC, and Perimeter Rd Expansion		
Duration (months):	1	Assumes 1 month of active grading.
Site Acreage:	0.8	
PM10 Emitted (tons):	0.01	
TSP Emitted (tons)[b]:	**0.014**	Assumes TSP is 64% PM10
Mitigated TSP Emitted (tons):	**0.005**	
Transmission Line Trench		
Duration (months):	4	Assumes 4 months of active grading.
Site Acreage:	1.8316	
PM10 Emitted (tons):	0.08059	
TSP Emitted (tons)[b]:	**0.12592**	Assumes TSP is 64% PM10
Mitigated TSP Emitted (tons):	**0.04407**	Assume 65% reduction in PM10 with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4
Total Unmitigated TSP Emitted (tons)	**0.62074**	
Total Mitigated TSP Emitted (tons)	**0.21726**	Assume 65% reduction in PM10 with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4

[a]Emission Factor Source: Midwest Research Institute, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure
[b]Conversion Factor Source: Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans. December 1999

Wind Blown Dust		
TSP Emission Factor (ton/acre/year)	0.38	Emission Factor Source: AP-42, Section 11.9 Western Surface Coal Mining Table 11.9-4, January 1995.
New Substation		
Acres exposed	**2.80**	Assumes only 10% is bare during construction
Duration (months)	**12**	Assumes 12 months of construction after grading
TSP Emitted for Site (tons):	**1.064**	
Mitigated TSP Emitted (tons):	**0.372**	Assume 65% reduction in TSP with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4
New Aux Boiler, ACC, and Perimeter Rd Expansion		
Acres exposed	**0.06**	Assumes only 10% is bare during construction
Duration (months)	**12**	Assumes 12 months of construction after grading
TSP Emitted for Site (tons):	**0.024**	
Mitigated TSP Emitted (tons):	**0.008**	Assume 65% reduction in TSP with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4
Transmission Line Corridor		
Acres exposed	6.868	Assumes only 50% of corridor is exposed soil
Duration (months):	2	Assumes 2 months of construction
TSP Emitted (tons)[b]:	**0.435**	
Mitigated TSP Emitted (tons):	**0.152**	Assume 65% reduction in TSP with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4
Total (tons) without mitigation	**1.523**	
Total (tons) with mitigation	**0.533**	Assume 65% reduction in PM10 with watering thrice daily per SCAQMD CEQA Handbook (1993) Table 11-4
	2.144	
	0.750	

Estimate of Soil Loss by Water Erosion Using Revised Universal Soil Loss Equation (RUSLE2)
Sutter Energy Center Petition to Amend #6

Feature (acreage)[b]	Activity	Duration (months)	Estimates Using Revised Universal Soil Loss Equation[a] Soil Loss (tons) without BMPs	Soil Loss (tons) with BMPs	Soil Loss (tons/yr) No Project
New Substation (28 acres)	Grading	1	3.03	0.004	0.50
	Construction	12	1.76	0.05	---
New Aux Boiler, ACC, and Perimeter Rd Expansion (0.79 acres)	Grading	1	0.07	0.0001	0.01
	Construction	12	0.03	0.001	
Transmission Line (1.8 acres for the trench; 4.6 acres for the construction corridor)	Grading	4	0.77	0.04	0.23
	Construction	2	0.68	0.02	---
Project Soil Loss Estimates	All activities listed above	13	**6.34**	**0.11**	**0.74**

Notes:

a. Soil losses (tons/acre/year) are estimated using RUSLE2 software available online [http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_index.htm].
-The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped soil unit.
-Soil loss (R-factors) were estimated using 2-year, 6-hour point precipitation frequency amount for the Sutter Calpine site [online at http://hdsc.nws.noaa.gov/hdsc/pfds/].
-Estimates of actual soil losses use the RUSLE2 soil loss times the duration and the affected area. The No Project Alternative estimate does not have a specific duration so loss is given as tons/year.

b. Acreages assume a 60-ft construction corridor for the transmission line, and a 8 ft wide trench for line installation.

Other Project Assumptions as follows:
-100% of the Sutter Calpine substation site will be exposed during grading. It is assumed that 10% of the site will be bare soil during construction.
-It is assumed that the grading of the substation site will take 1 month and construction will take 12 months.
-It is assumed that the excavation/installation for the underground transmission line will take 4 months and that the trenches will be covered and re-seeded within 2 months.

RUSLE2 Assumptions as follows:
100-ft slope length. Estimated soil unit slope is the midpoint of the minimum and maximum of the unit slope class.
Construction soil losses assume the following inputs: Management - Bare ground; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.
Grading soil losses assume the following inputs: Management - Bare ground/rough surface; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.
Construction with BMP soil losses assume the following inputs: Management - Silt fence; Contouring - Perfect, no row grade; Diversion/terracing - None; Strips and Barriers - 2 fences, 1 at end of RUSLE slope.
No Project soil losses assume the following inputs: Management - Dense grass, not harvested; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.

RUSLE 2 Calculations
Sutter Energy Center Petition to Amend #6

Soil Type	Acreage		Soil Loss Estimates Using RUSLE2 software (tons/ac/year)			
		Slope	Grading	Construction w/o BMPs	Construction with BMPs	No Project
New Substation						
153	28.0	1.0	1.3	0.63	0.018	0.018
	2.80	**Subtotal**	**36.40**	**1.76**	**0.05**	**0.50**
New Aux Boiler, ACC, and Perimeter Rd Expansion						
132	0.79	0.5	1.1	0.47	0.013	0.013
	0.79	**Subtotal**	**0.87**	**0.03**	**0.0008**	**0.01**
Transmission Line						
132	3.64	0.5	1.1	0.47	0.013	0.013
153	9.63	1.0	1.3	0.63	0.018	0.018
174	0.47	1.0	1.6	0.74	0.021	0.021
	13.74	**Subtotal**	**2.30**	**4.06**	**0.12**	**0.23**

Assumptions:
Substation, new aux boiler, and ACC will have 10% bare soil during construction and 100% bare soil during grading.
100% of trench areas will be bare soil during grading/excavation
50% of transmission line corridor will be bare soil during construction.
Transmission line corridor construction impacts based on a 60 ft construction corridor along entire length.

Site Areas
Sutter Energy Center Petition to Amend #6

Project: Sutter Calpine Updated 1/07/13 JLK

New Construction

OBJECTID	AREASYMBOL	Shape_Leng	Shape_Area_SF	Grading Acres	Construction Acres	
Proposed Substation	153			28.0	28.0	Acreage from Sarah Madams, 01/16/2013
					2.80	Assumes 10% of site is bare soil during construction
				Trench Acres	**Construction Corridor**	
Tranmission Line	132	2646		0.4860	3.6449	Assumes a 60 ft wide construction corridor with a 8 ft wide trench (per Doug Davy's email dated 2/19/2013).
	153	6989		1.2835	9.6266	Assumes a 60 ft wide construction corridor with a 8 ft wide trench (per Doug Davy's email dated 2/19/2013).
	174	338		0.0621	0.4655	Assumes a 60 ft wide construction corridor with a 8 ft wide trench (per Doug Davy's email dated 2/19/2013).
	Sum	**9973**		**1.83**	**13.7**	**Sum**
					6.87	Assumes 50% of the construction corridor is bare soil during construction.

Within Existing SEC Footprint

OBJECTID	AREASYMBOL	Shape_Leng	Shape_Area_SF	Grading Acres	Construction Acres	
Aux Boiler	132		312	0.0072	**0.007**	26'x12' footprint per Doug Davy's email dated 2/19/2013
				0.0072	**0.0007**	Assumes 10% of site is bare soil during construction
Air Cooled Condensor Expansion						
	132		27200	0.6244	**0.62**	340'x80' footprint per Doug Davy's email dated 2/19/2013
				0.62	**0.0624**	Assumes 10% of site is bare soil during construction
Perimeter Road Expansion						
	132	336	6888	0.16	**0.16**	Estimated 20.5 ft wide, 336 feet long new road (based on calcs from existing road via Google Earth)
				0.16	**0.00**	Assumes road is completely paved or gravelled after grading.
				Sum grading acres 0.790	**0.0632**	**Sum construction acres**

GIS Data

Sutter Energy Center Petition to Amend #6

MUSYM	muname	LEGEND	Acres
153	Oswald clay, 0 to 2 percent slopes	Proposed Substation	29.5

MUSYM	muname	LEGEND	Shape_Leng	Miles
132	Gridley clay loam, 0 to 1 percent slopes	Proposed Underground Transmission Line	2646.2	0.50
153	Oswald clay, 0 to 2 percent slopes	Proposed Underground Transmission Line	6988.9	1.32
174	Tisdale clay loam, 0 to 2 percent slopes	Proposed Underground Transmission Line	337.9	0.06

IS012313174350SAC